Economic Ideas and Policy Implementation: Evidence from Malthusian Training in British Indian Bureaucracy

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Abstract

Public officials often fail to implement government policy as directed, yet the role of economic ideas in shaping these implementation choices is poorly understood. This paper provides causal evidence that exposure to economic ideas can durably influence bureaucrat behavior. I study British colonial bureaucrats in India, exploiting a natural experiment created by the abrupt death of Thomas Malthus in 1834, replacing his economics instruction at a bureaucrat training college for that of a contemporary critic, Richard Jones. Whereas Malthus regarded economic distress as a natural mechanism for restoring equilibrium by reducing population growth, Jones disagreed with this view. Linking rainfall shocks to district-level fiscal responses, I show that officials trained by Malthus delivered less relief during droughts, providing 0.10-0.25 SD less aid across all major measures compared with officials taught by Jones. The results reveal that exposure to abstract economic ideas can shape real-world policy implementation for decades.

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JEL codes: D73, M53, J24

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"[The] ideas of economists and political philosophers, both when they are right and when they are wrong, are more powerful than is commonly understood. Indeed the world is ruled by little else. Practical men, who believe themselves to be quite exempt from any intellectual influences, are usually the slaves of some defunct economist." - John Maynard Keynes (1936)

1 Introduction

Public servants frequently fail to implement government policy as intended by principals, and these failures often diminish the provision of public goods and services.[1] Theory suggests that implementation failures arise from conflict between the objectives of principals and agents, and therefore that interventions targeting mechanisms responsible for misalignment can improve efficiency (Tullock, 1965; Niskanen, 1971; Tirole, 1994). Although economic research proposes a range of interventions to address canonical sources of inefficiency, such as corruption and shirking, other neglected mechanisms may continue to disrupt alignment and diminish public services.[2]

One such mechanism, suggested by qualitative evidence but minimally studied in economics, concerns the influence of various economic rationales (such as laissez-faire) on the discretion of public servants (Ash et al., 2025). Despite frequent speculation among economists that these ideas exercise substantial influence on policy, empirical evidence which could inform targeting of this mechanism is limited.[3] The dominant challenge in this line of inquiry involves distinguishing between a real influence of ideas versus a standard counterargument: that economic ideas merely "beef up the arguments of movers and shakers who have already made up their minds for quite other reasons" (Solow, 1989, p. 75).

To solve this challenge, I exploit a unique historical experiment in a nineteenth-century British bureaucracy, focusing on an argument that Malthusian population theory and its associated ideas discouraged policymakers from intervening in response to agricultural distress and famine (Ambirajan, 1976, 1978). Central to my approach is a bureaucrat training college, Haileybury, where civil servants studied prior to their careers in British India (henceforth, India). Thomas Malthus taught

[1] Empirical evidence demonstrates that implementation failures can diminish provision of public goods and services (Olken, 2007; Duflo et al., 2012). Other modern examples include the failure of drought management authorities to distribute funds in Kenya (Office of the Auditor-General, 2020) and failure of Philippine authorities to distribute relief after Typhoon Yolanda (Commission on Audit, 2014), while in India the Supreme Court had to intervene to compel a government response to drought (Reuters, 2016).

[2] For just a few examples of studies which have focused on these traditional mechanisms, see Becker and Stigler (1974), Duflo et al. (2015), and Das et al. (2016).

[3] Examples of economists who have speculated on the influence of ideas include Keynes (1936), Sen (1982), Solow (1989), and Rodrik (2014). I follow the Solow (1989) definition of economic ideas as everything "ranging from new but unelaborated concepts through isolated propositions about causality, all the way to full-blown theories."

economics at Haileybury for nearly three decades, from 1805 until his abrupt death in 1834, after which he was replaced by a contemporary critic, Richard Jones. I examine how the relative differences in exposure of bureaucrats to economic ideas under each instructor at Haileybury influenced their subsequent policy decisions, as well as their alignment with government directives.[4]

Malthus envisioned poverty as an inevitable consequence of excessive population growth, in which an expanding population undertook cultivation of progressively less productive land, leading to a commensurate decline in living standards. In this view, therefore, population growth increased economic distress and eventually led to consequences such as poverty and famine. Jones disagreed with Malthus, arguing that capital investment and technological progress in agriculture could offset any diminishing returns from expanding agricultural employment.

In the Malthusian view, economic distress was a natural mechanism for raising living standards by reducing population growth, and government efforts to relieve distress could ultimately aggravate it further by weakening the incentives to have smaller families. Qualitative evidence suggests that these Malthusian ideas discouraged colonial officials from intervening during famines by emphasizing "the futility of doing anything to prevent distress" (Ambirajan, 1978, p. 59).[5] I hypothesize therefore that British bureaucrats who studied under Malthus were less likely to take measures to supplement incomes in response to economic distress during their careers in India.

To evaluate the effects of exposure to these ideas, I begin by constructing a novel dataset of British bureaucrats and their policy decisions across India. I focus on the fiscal policy responses of district collectors, the principal government agent of the district, to rainfall shortages. Contemporary accounts indicate that rainfall shortages were the dominant cause of agricultural scarcity and famine in India during this period (Indian Famine Commission, 1880). I corroborate these claims by demonstrating empirically that rainfall shortages increase the probability of famines and raise the prices of agricultural commodities.

My empirical approach compares policy responses to drought between bureaucrats of each training regime. The central threat to identification is that responses to drought may also be determined by characteristics correlated with assignment to training or with the timing of appointments to districts.[6]

[4]The objectives of the colonial state are not immediately obvious. Ambirajan (1978, p. 68) points out that official statements supporting intervention may have been merely "platitudes on the necessity of looking after the well-being of the people," or else that leadership genuinely believed it "essential for the state to take active steps to mitigate the rigours of famine." Comprehensive reports give the impression of a government truly concerned with the "protection of the people of India from the effects of the uncertainty of the season" (Indian Famine Commission, 1880, p. 1), and my empirical results will show that the colonial state seems to have indeed preferred efforts to limit distress.

[5]Historical episodes point to several ways in which Malthusian ideas might have exercised an influence on government policy. These ideas have been implicated for encouraging policies to reduce population growth, as in the case of China's one-child policy (Greenhalgh, 2008), and for discouraging policies to alleviate poverty or supplement incomes, as in the case of Ireland's Great Hunger (also known as the Irish Potato Famine) (Gráda, 1989; Sherman, 2007).

[6]Bureaucrats who studied with Malthus were gradually replaced by those who studied with Jones in accordance

My main approach relies on the random incidence of drought; I show that observable district and bureaucrat characteristics are balanced across training regimes during drought, supporting this strategy. A refinement to this approach further supports identification by leveraging the plausibly random timing of the death of Malthus, relaxing balance of unobservables in favor of continuity across cohorts.

I examine several fiscal countermeasures which comprised the most common government relief measures during this period: writing off taxes on agricultural land, opening public works to provide employment opportunities and raise wage income, distributing cash or food aid, importing food for subsidized sale, and providing loans or advances to the agricultural class (Indian Famine Commission, 1880). I test for relative differences in the implementation of these measures during drought across bureaucrats by training regime. My main finding is that, compared to their Jones-trained (Jonesian) counterparts, Malthus-trained (Malthusian) bureaucrats were less likely to provide relief across all of these common government interventions. I show that tax write-offs during drought were roughly thirty percent lower under Malthusian collectors than under Jonesians and I find evidence that expenditures on public works may have been up to twenty percent lower.

I capture the extensive margin of additional relief measures by performing a novel, text-based imputation of the probability of each intervention being implemented across the entire panel dataset, based on textual accounts written by British officials.[7] I find that each measure is more likely to be mentioned under Jonesians during drought; the opening of relief works, distribution of cash and food aid, imports of food, and provision of loans are between one-tenth and one-fourth of a standard deviation less likely to be mentioned in these accounts under Malthusian collectors.

Moreover, from the available archival records on personnel performance, I find evidence that Malthusian collectors were less likely to be favorably rated than their Jonesian counterparts during drought, a result which seems to be driven by relative differences in their responses to the most extreme rainfall shortages. Lastly, I find no differential effect on the probability of famine or on mortality, though this conclusion is limited by the lack of reliable and complete records. In terms of caloric subsistence, these policy differences could have been large enough to alter mortality rates; a back-of-the-envelope calculation suggests that, if Malthusian collectors had implemented policies comparable to Jonesians, the increased aid would have translated into enough calories to support two million more person-days of subsistence during each episode of drought.

with the system of seniority-based promotions in the civil service.

[7] Comprehensive data these additional interventions, such as the opening of relief works, import of food, and provision of loans, were impossible to obtain, as surviving records are sparse and incomplete. Much of this data seems to have never been recorded, as contemporary officials could not locate many of these accounts. For example, Indian Famine Commission (1880, p. 31) tabulate the government relief measures for which they could find records, noting that missing entries "more frequently mean that there is no information on record than that nothing ought to be entered under the heading in question."

The results suggest that training programs represent a powerful tool for principals to shape how agents implement policy. I find the largest policy differences across bureaucrats entrusted with the greatest authority, as well as those of lowest academic ability, implying that modern training programs which target these groups would be most likely to alter implementation. Conversely, if principals choose not to deliver training to these groups, then the implementation of policies sensitive to this mechanism may persistently and substantially diverge from policy intent.

One explanation for the results is that bureaucrats weigh their efforts to provide a public good or service against the potential for those efforts to be eroded by economic forces. Many bureaucrats face similar tradeoffs today; they might, for example, worry that unemployment benefits limit incentives to find work, or that government purchases crowd out private activity, or that regulation reduces competition.[8] The evidence implies that delivery of economics training to these officials could alter their discretion and performance over a very long time horizon, possibly the full course of their career. Principals designing and targeting these programs will therefore have to contend with the influence of various types of ideas to which bureaucrats have already been exposed, and should carefully consider which types of residual ideas could be included in training to encourage alignment. As demonstrated from this case, the stakes of these decisions can be substantial.

This research contributes to the literature in three main areas. Most immediately, this paper contributes to the literature on bureaucracy and development.[9]. There is substantial evidence that state capacity promotes economic development and economic growth (Besley and Persson, 2009; Acemoglu et al., 2015). Because bureaucrats perform critical functions on behalf of the state, a growing literature studies how governments can influence and improve their performance.[10] Some empirical evidence has documented the influence of ideas (Ash et al., 2025) and political ideology (Spenkuch et al., 2023) on performance, as well as the likely presence of information frictions in policymaking more broadly (Hjort et al., 2021). I contribute to this literature by offering new evidence on how the exposure of bureaucrats to different types of economic ideas can affect policy implementation and performance, and I offer new lessons on how training programs might be targeted to better align implementation with the objectives of principals.

Second, I contribute to literature on the sociopolitical consequences of ideas and beliefs. One strand of this literature considers how colonial-era economic ideas shaped economic policy (Stokes, 1959;

[8]Droughts and other natural calamities are also not unique to nineteenth century India; officials today face an ever more volatile climate and sometimes must make critical decisions to address poverty or hunger.

[9]For a review of the literature on bureaucracy and development, see articles by Besley et al. (2022) on the relevant economics literature and (Pepinsky et al., 2017) for the literature in political science.

[10]For example, economists have studied bureaucrats' recruitment (Dal Bó et al., 2013; Weaver, 2021), incentives (Khan et al., 2016, 2019; Bandiera et al., 2021), selection (Xu, 2018), promotions (Aman-Rana, 2025), and mission motivation (Khan, 2025). Closely related is Xu (2023), who examines how the type of bureaucrat in district administration (British versus Indian district officer) affected the response to the 1918 influenza pandemic in India.

Ambirajan, 1976, 1978) and has had surprising influence on more modern economic research (Banerjee and Iyer, 2005; Sen, 1982; Donaldson, 2018).[11] Another branch focuses on the consequences of political ideology, broadly defined as the ideas and attitudes associated with a political party or movement (Bjørnskov, 2005; Gentzkow and Shapiro, 2010; Spenkuch et al., 2023; Bai et al., 2023), while others have measured the effects of distributing ideas through propaganda (Yanagizawa-Drott, 2014) or school curriculum (Fuchs-Schündeln and Masella, 2016; Cantoni et al., 2017). My results offer new evidence on how exposure to different types of ideas can transmit into government policies, as well as the magnitude and persistence of their influence.

Third, I contribute to the literature on famines, a topic of both classical and contemporary interest. Economists have considered the role of factors such as markets (Smith, 1776), demographics (Malthus, 1826), and political incentives (Sen, 1982) in causing famine; these factors continue to be investigated in modern research (Besley and Burgess, 2002; Burgess and Donaldson, 2010; Ashraf and Galor, 2011; Meng et al., 2015; Markevich et al., 2024). Roy (2016) proposes that state capacity constraints such as limited scientific knowledge or fiscal capacity can restrict the ability of the state to prevent famine. My results indicate that the training delivered to the agents of the state can also alter the state's ability to respond to hunger, and therefore may be another important factor in explaining episodes of extreme food insecurity and famine.

2 Background

2.1 Haileybury College

Haileybury was established in 1805 to train bureaucrats before their appointments in British India.[12] Upon graduation, these civil servants traveled to India and found positions in the military, customs offices, and district administration. The curriculum at the college included courses on languages such as Urdu and Bengali, as well as standard curriculum such as classics and mathematics (Bowen, 1955). In addition to these fields, the school introduced England's first professorship in political economy when it hired Thomas Malthus as its instructor.[13] Malthus lectured on political economy at Haileybury for nearly three decades until his abrupt death in 1834, when Richard Jones was

[11] Stokes (1959) discusses how the theory of rent advanced by Ricardo (1817) shaped the formation of land tenure institutions in colonial India. This directly motivates an instrumental variable approach by Banerjee and Iyer (2005) and also explains why British officials painstakingly collected statistics on agricultural production from which they measured rent and determined tax liabilities, but also which allowed Donaldson (2018) to estimate agricultural output. The influential work of Sen (1982) was partly inspired by the arguments of Ambirajan (1976, 1978).

[12] The requirement that all civil servants graduate from Haileybury was a mandate included in the East India Company Charter in 1813 (Bowen, 1955).

[13] Evidence on the hiring process discussed by James (2013, p. 173) suggests that this was not a difficult choice, as the number of distinguished candidates were so few that the selection of Malthus was almost a foregone conclusion.

selected to replace him. Jones held this position for the next twenty years, until just before his own death in early 1855, shortly before the closure of the college outright in 1858 (Tribe, 1995).

2.2 Malthus and Jones

The central disagreement between Malthus and Jones involved their views on the relationship between population and agricultural productivity. Malthus believed that population growth would eventually reduce agricultural productivity and diminish living standards, a result which followed from his assumptions that "[p]opulation, when unchecked, increases in a geometrical ratio" while the supply of food "increases only in an arithmetical ratio" (Malthus, 1798, p. 4). In his view, poverty and famines were natural mechanisms, "positive checks" which ensured that population remained within the bounds of the food supply.[14] In the self-regulating system outlined in his theory, interventions intended to alleviate the distress accompanying these checks were destined to fail. For example, in application to a contemporary anti-poverty welfare program, Malthus argued that it "defeat[s] its own purpose" as, although it might relieve the distress of a few, it would ultimately only "spread the general evil over a much larger surface" (Malthus, 1798, p. 24, 27).

Jones rejected the Malthusian assertion that agricultural productivity eventually declines as population rises. "No causes of inevitable decay," he wrote, "haunt the fortunes of any class during the progressive development of the resources of a country" (Jones, 1831, p. xxxviii). Jones broke with Malthus over what he saw as the mistaken assumption of a "supposed continuous diminution in the returns to agriculture and then, by an erroneous inference from a fact itself false, a corresponding incapacity in mankind to provide resources for increasing numbers" (Jones, 1831, p. xiii). Jones believed productivity growth was unbounded; from his perspective, there was "no necessary decrease in the returns to agricultural labor and capital, as cultivation spreads to soils of inferior quality, or extracts a greater produce from the soils already cultivated" (Jones, 1831, p. 275).

Malthus and Jones were occasionally explicit in their criticism of each other. Jones, for example, expressed his contempt for "those dismal systems which teach that the whole human race is under the resistless dominion of an impulse, forcing ever its aggregate numbers forwards to the extreme limit of the subsistence they can produce" (Jones, 1831, p. xviii), arguing that "the facts... are utterly inconsistent with the dogma that population is always increasing, or trying to increase, beyond the supplies of food" (Jones, 1859, p. 99). Upon reading Jones' work, Malthus was quick to recognize the inconsistency of Jones' views with his own, lamenting Jones' "unwillingness to admit the tendency of continued accumulation, and of the progress of population and cultivation to

[14] As Malthus describes, "[f]amine seems to be the last, the most dreadful resource of nature. The power of population is so superior to the power in the earth to produce subsistence for man, that premature death must in some shape or other visit the human race" (Malthus, 1798, p. 44).

lower the rates of profits and corn wages on the land" (De Marchi and Sturges, 1973, p. 389).[15]

These disagreements extended to their perspectives on productivity and living standards in India. Malthus argued from historical evidence that the "tendency to early marriages" led to the "natural consequence... that the lower classes of people were reduced to extreme poverty" so that "every failure in the crops from unfavourable seasons would be felt most severely" (Malthus, 1826, p. 196).[16] In stark contrast, Jones saw in India tremendous agricultural potential, a region where "half the rich territory... has never been cultivated, though swarming with a population to whom the permission to make it fruitful in moderate security, would have been happiness" (Jones, 1831, p. 117). In contrast to the Malthusian claim that poverty in India was due to excessive population, Jones instead saw this as a result of failures in governance which discouraged or disrupted investment.[17]

Their differences of opinion featured prominently in the classroom. The lecture notes of one student of Malthus, for example, remark that "the encouragement of marriage on the poor is to keep the reward of labour as low as possible and consequently to press them down to the most abject state of poverty" (James, 2013, p. 421). Another student of Malthus describes a classroom environment centered almost entirely on Malthusian population theory. "The great idea upon which Malthus was always harping," the student wrote, "was the terrible increase of our population. He was continually setting before us the fearful rate at which the population was increasing... gravely did he urge upon us... the duty and necessity of our never having more than three children" (Venn, 1904, p. 179).

Jones likewise seems to have emphasized his disagreement with the ideas of Malthus, with one former student describing the "contemptuous way in which he settled Malthus's theory of "misery, vice, and moral restraint" I can recollect to this day" Danvers et al. (1894, p. 177).[18] In his lectures, Jones (1859, p. 478) taught how Malthus "generalized too rapidly from the almost instantaneous impulse which he saw given to the progress of numbers" from a rise in wages, contrasting these claims against his own view that steady progress in wage growth "might find the laborers in the same position as the classes immediately above them were a century before." Jones' lectures on population were even more explicit, describing the "one great vital error" committed by Malthus in "the assumption that... the human race has a constant tendency to increase... beyond the point at which the earth can produce food and subsistence for its numbers" (Jones, 1859, p. 469).

[15] In the view of Malthus, Jones' departure from this assumption must have "gone beyond the truth," because if "cultivation and population has no tendency to diminish corn wages, I do not see what cause should ever retard the rate at which population is known to increase in the new colonies" (De Marchi and Sturges, 1973, p. 389).

[16] In his view, these practices were to blame for the frequent famines in the region, as the pressure of unrestrained population growth led India to be "in all ages... subject to the most dreadful famines" (Malthus, 1826, p. 197).

[17] Jones argued that this arose instead from excessive appropriation of produce from peasants and from insecurity of government contracts with tenants.

[18] Another student recounts "his allusions to "poor dear Malthus" who... was wrong" Danvers et al. (1894, p. 176).

2.3 Economic language

To complement the qualitative evidence from the recollections of students and the contents of the lectures of Jones, I also examine differences in quantitative descriptive statistics between the writings of Malthus and Jones.[19] I use these texts first to examine differences in the vocabulary and the emphasis of various topics between the two authors.

Figure 1 presents wordclouds for the top 100 words from writings of Malthus and Jones. This simple frequency-based visual captures the greater emphasis of Jones on the role of investment in determining the level of wages. While Malthus discusses population and labor more frequently than any other factor, Jones discusses both labor and capital with high frequency. These are the most frequently mentioned words by either author, and are consistent with the relative emphasis on the economic factors which determine living standards: population, in the case of Malthus, and investments, in the case of Jones.

I also consider simple descriptive statistics in the average similarity of vocabulary between reports authored by Malthusian and Jonesian collectors, written during their careers in India many years after they graduated from the college. I have less than three-hundred of these reports, though they comprise more than fifty thousand sentences.[20] Panel A of Table 1 shows that reports authored by Malthusian collectors may have been more likely to invoke more Malthusian language in their writings (model 1); though this narrowly misses statistical significance (p-value = 0.101), their relative vocabulary similarity with Jones seems to be more precisely null (model 2).

Moreover, in Panel B the average sentence authored by a Malthusian collector does seem to be more similar in its vocabulary to the writings of Malthus (model 4, p-value = 0.011), and also relatively more similar to the vocabulary of Malthus than to Jones (model 6, p-value = 0.067), while the similarity of Malthusian-authored sentences do not exhibit any differences in similarity with the vocabulary of Jones compared with Jonesian-authored sentences (model 5). These descriptive statistics demonstrate that Malthusian collectors did invoke relatively more vocabulary characteristic of the writings of Malthus in their reports, compared with Jonesians, suggesting that they might have also adopted or invoked some of the ideas to which they were exposed in the classroom.

2.4 Indian famines and relief policies

Historical accounts and contemporary empirical analyses indicate that famines in India were most immediately due to a shortage of rainfall, which induced scarcity of agricultural production (Indian

[19] I obtain text from Malthus' *Principle of Population* and *Principles of Political Economy*, as well as Jones' *Essay on the Distribution of Wealth*. I add to this his *Literary Remains*, which included a large number of his lectures.

[20] Further discussion of the construction of these similarity measures is included in the data section and data appendix.

Famine Commission, 1880; Bhatia, 1967; Burgess and Donaldson, 2010; Mishra et al., 2019). Under British rule between 1803 and 1878, an incident of mass scarcity or famine occurred on average every four and a half years (Indian Famine Commission, 1880). Severe famines could affect either small local areas, such as the 1832 Guntur famine, or massive regions across the subcontinent, as in the case of the 1783 Chalisa famine. In the most extreme cases, some contemporaries estimate that the scale of death could exceed thirty or forty percent of the affected population (Eliot, 1895), though official statistics which could corroborate these figures were almost always unavailable or unreliable.

Land taxes were the dominant revenue source under the early British colonial system; by 1855, land taxes comprised fifty-six percent of British government revenues in India (Hendriks, 1858, p. 228). During periods of scarcity, such as shortages of rainfall, reductions in the collections of land taxes were the most frequently recorded measures of famine relief, accounting for one-third of government relief measures in the accounts available to Indian Famine Commission (1880, p. 31-33). These tax records are the only contemporary relief measures which were systematically recorded and available in the surviving archival records today.[21]

Financial evidence indicates that much of the remainder of government relief efforts consisted of opening government works, importing food, distributing gratuitous relief, and administering government advances. Government works, the opening of public projects to provide employment and income for laborers in economically depressed regions, comprised close to thirty percent of recorded government expenditures during famines; gratuitous relief, the phrase used to refer to the distribution of food or cash to affected villages or in relief camps, represented another seven percent of these expenditures; the imports of food, arranged by government authorities to distribute at either free or discounted rates to distressed locals, made up another thirty percent; and government advances, in which authorities would provide small loans to the agricultural class to preserve liquidity and prevent the selling off of capital or consumption of seed stocks, comprised the remaining three percent of recorded government expenditures (Indian Famine Commission, 1880, p. 31-33).[22]

[21] The significance of tax relief in this setting is well-recognized in popular culture, most notably in the Bollywood film *Lagaan* (2001), which centers around the struggle between villagers and British officials as they negotiate tax relief during drought.

[22] These figures are calculated as the share of each item out of the total expenditure on government works, imports of food, gratuitous relief, government advances, and loss of land revenue as reported by Indian Famine Commission (1880, p. 31-33) during famines over the period from 1803 to 1876.

2.5 District administration

The district administration of India consisted of three main roles: the judge, who presided over the judiciary; the magistrate, who controlled the police, jails, and criminal courts; and the collector, who controlled the district treasury.[23] While the offices of collector and magistrate were held by the same individual in some districts for the entire sample period, in many others they were not combined until after 1858, when the civil administration of India transferred formally from Company to Crown rule (Sircar, 1988, p. 80-81).

The combination of these offices under a single individual entrusted the magistrate-collector with such tremendous discretionary authority that it "imparted to his administration the appearance of personal rule" (Misra, 1977, p. 86-87). The Imperial Gazzetteer of India (Nathan et al., 1909, p. 50-51), an encyclopedic directory maintained by British officials, outlines the "multifarious duties" of the collector-magistrate in detail:

> "[T]he Collector has to interest himself in all matters affecting the well-being of the people... In times of stress and difficulty his duties and responsibilities are increased tenfold... Should the District be attacked by famine he is responsible for the lives of the people; he must watch minutely, and keep the Government informed of the progress of events, and must organize and carry out the measures of relief."

The implementation of government policy during periods of crisis therefore substantially depended on the measures taken by the district collector.

3 Data

I construct my data from a variety of published historical documents and unpublished archival records. I obtain the majority of the data by digitizing statistical appendices from government publications, focusing on the four provinces which were governed by members of the Indian Civil Service as highlighted in Figure A1.[24] I briefly describe each source involved in the construction of the data below. Additional details are available in the data appendix.

Collector assignments I construct the history of district collector assignments from official

[23] Promotions into district administration were made on the basis of seniority (Brown, 1985, p. 54). Appointments to more senior levels, such as positions in the provincial judiciary or revenue departments, were often at the discretion of the governor-general (Mills, 1858, p.60-61).

[24] These provinces are Bengal, the Northwest Provinces, Madras, and Bombay. These provinces are generally referred to by British officials as "regulation provinces," and their counterparts (administered primarily by military officials) in the Punjab, Central Provinces, and elsewhere as "non-regulation provinces."

registers. These records provide the name and titles of the collector assigned to the district in each year, and also denote whether the collector was entrusted with magistrate powers.

College cohort I obtain records on Haileybury graduates from Danvers et al. (1894). These records include the name, year of graduation, academic awards earned at Haileybury, and a brief overview of career details in India. I define as *Malthusian* all collectors who entered the civil service between 1805 and 1834, the interval between the initial hiring and ultimate death of Malthus, and I define as *Jonesian* all collectors who entered the civil service between 1835 and 1854, the interval ranging from the first to last years during which Jones taught at the college.[25]

Economist texts I obtain the full text from two works for each of Malthus and Jones.[26]

Collector reports I extract reports written by Madras collectors and appended to the annual Land Revenue Reports for the province; Madras was the only province which published these. I extract all text from the relevant pages of these reports, and I match reports with rainfall measures based on the year of the land revenue report which they describe.

Tax and collector performance records I obtain data on land tax liabilities, collections, and tax write-offs from the land revenue reports of each province, over the period 1846 to 1885.

The annual land revenue reports of Bengal also contain lists of officers commended by superior officers for their performance in the respective year, as well as a set of identical records for several years in the Northwest Provinces. I use these subjective evaluations to construct a binary measure of whether a collector in a given district-year was commended for their performance.

Public works expenditures For Madras, I obtain a panel of public works expenditures at district-year level over the period from 1857 through 1876 from the statistical appendices included in its annual Administration Reports.

Commodity prices I collect data on the prices of common food-grains from statistics published by the Department of Finance and Commerce (1887) for a selection of districts across all provinces during the period 1861-1886, and I supplement this with additional price data published in the land revenue reports of the Northwest Provinces (1848-1853) and Madras (1853-1885).[27]

[25] I exclude all collectors who entered the service after 1854, the last year that Jones taught. There are no collectors in the panel who entered the civil service before Malthus began teaching in 1805.

[26] These include their respective seminal works: Malthus (1826) and Jones (1831), along with *Principles of Political Economy* (Malthus, 1836), a publication which Malthus intended for use as a textbook in political economy, and *Literary Remains of Richard Jones* (Jones, 1859). For text analysis, I treat each author's combined works as a single source and add another contemporary author as a separate source, Ricardo (1817), who discusses similar content to Malthus and Jones, in an effort to purge boilerplate economic language in favor of author-specific vocabulary.

[27] I include records from the land revenue reports for any missing district-commodity-years, restricting only to those food-grains reported on in the primary source data in Department of Finance and Commerce (1887). There are ten types of food-grains in the data: arhar/thur (pigeon pea), bajra/cumbu (pearl millet), barley, gram (chickpea), jowar/cholum (sorghum), kangni/kakun (foxtail millet), maize (corn), marua/ragi (finger millet), rice, and wheat.

District boundaries The Indian Ocean World Center, McGill University kindly provided the initial shapefiles for this study, digitized from an 1871 census map (Office of the Registrar General et al., 2011).[28] I expand the coverage of districts by digitizing maps published alongside the Administration Reports of Bengal (1872-73) and the Punjab (1877-78), and use this data to measure total district area, spatially merge rainfall stations to the district in which they were located, and measure famines from maps as described below.

Famines My primary measure of of famine comes from the Imperial Gazzetteer (Nathan et al., 1909). I manually construct a measure of famine from the Gazzetteer by recording all calendar years listed under the famine section of each district's entry in the Gazzetteer. [29] I define district-years as famine-affected if a given year is mentioned in the district's history of famines reported in Nathan et al. (1909), or else if any part of the district overlaps with the region and period pertaining to a map in Srivastava (1968). I also obtain a measure of famine intensity by conducting a sentiment analysis of the text in Nathan et al. (1909), and separately from Srivastava (1968) by measuring the district area falling under each color-coded famine intensity classification.

Extensive-margin probabilities of government intervention The textual accounts of famines for each district in Nathan et al. (1909) often describe government relief measures undertaken in the district-year during a given famine. I make use of these textual accounts to also capture the extensive margin of government intervention, in order to complement the financial measures I observe on tax write-offs and expenditures. I impute these text-based probabilities by tasking a neural network with assigning probabilities to each of several discrete labels, chosen based on the surviving evidence suggesting that these represented the vast majority of government relief expenditures (Indian Famine Commission, 1880, p. 31-33).

Additional district and collector characteristics I obtain several district characteristics from the replication archives of published economic research; I use the landlord classifications from Banerjee and Iyer (2005) and data on railroads and agricultural income from Donaldson (2018). I also obtain district-level mortality data for a selection of years from the provincial *Sanitary Reports*, and additional collector biographical details from Findmypast.com.[30]

Rainfall I obtain monthly rainfall for 434 stations from Blanford (1888). I follow Donaldson

[28] This data is covered by a CC-BY license, conditional on including the following accreditation: "This material was created at the Indian Ocean World Centre, McGill University for its Partnership Project, Appraising Risk, Past and Present (www.appraisingrisk.com). This project is supported by the Social Sciences and Humanities Research Council (SSHRC) of Canada."

[29] Famines are difficult to measure, especially in a historical setting with limited data. I follow previous economics research by relying on the definition applied by authors examining the historical record. Researchers such as Burgess and Donaldson (2010) collected famine incidence from Srivastava (1968). I also measure famine from the maps published in Srivastava (1968), but those records are temporally limited. The text entries in Nathan et al. (1909) represent an ideal alternative because they define famines clearly across all district-years in the nineteenth century.

[30] Findmypast.com is a genealogical website which has digitized and extracted data from various primary sources.

(2018) by spatially interpolating onto any missing station-month observation, and then averaging rainfall across all station-months within a district to obtain a district-month rainfall panel. For any missing district-months, I also supplement this with district-level rainfall data published in the annual land revenue reports for Madras.

3.1 Measurement

I measure rainfall shocks by standardizing rainfall in each district and year relative to the district-specific mean and standard deviations, as below:

$$rain\text{-}SD_{dt} = \frac{rain_{dt} - \mu_d}{\sigma_d}$$

where $rain_{dt}$ denotes the level of rainfall in the district d and year t, and μ_d and σ_d denote the average and standard deviation of rainfall in the district, calculated across all years with land revenue records[31]. I measure more extreme rainfall shortages, which I refer to as $droughts$, as:

$$drought_{dt} = \mathbb{1}\{rain\text{-}SD_{dt} < -1\}$$

Where $drought_{dt}$ is an indicator variable for the district-year rainfall falling at least one standard deviation below the district's average annual rainfall.

3.2 Descriptive statistics

Table 2 presents summary statistics for the main sample, which is an unbalanced panel comprised of all district-years with data on rainfall and tax write-offs and whose collectors entered the civil service between 1805 (when Malthus was hired) and 1854 (when Jones retired). Nearly thirty percent of collectors in the panel studied under Malthus at Haileybury. The study period begins in 1846 due to the availability of data on rainfall and tax records; the panel ends in 1885, the last year that I observe a Jonesian collector. This time period captures the transitional period as incumbent Malthusians are gradually promoted through the civil service and replaced by their more junior Jonesian counterparts. The average collector is serving their twenty-third year in the civil service at the time that I observe them in the panel, largely due the fact that the position of collector is a more senior position in the civil service.

Droughts are constructed to capture more extreme agricultural crises, and are somewhat rare,

[31] This covers nearly every year in Bengal from 1846 to 1885, in the Northwest Provinces from 1848 to 1885, in Madras from 1853 to 1885, and in Bombay from 1860 to 1885.

occurring only fifteen percent of the time in the sample. These are notably distributed evenly across Malthusian and Jonesian collectors, with one-third of droughts occurring under Malthusian district collectors, almost precisely in line with the percentage of district-years administered by a Malthusian collector (28%). Famines are likewise fairly rare, taking place only eight percent of the time in the full sample statistics from the Imperial Gazzetteer, though occurring more frequently in the temporally restricted sample from Srivastava (18%).[32]

The average quantity of taxes collected (in rupees) is much larger than the average quantity of tax write-offs (remissions) issued by collectors, but write-offs are right-skewed with a maximum more than thirty times its mean. This is consistent with tax write-offs serving as a fiscal stimulus and implemented in response to extreme local crises, while being low or zero during years without crises.

4 Empirical strategy

Due to the disagreements between Malthus and Jones with respect to the validity of Malthusian population theory and the causes of poverty and famine, I focus on the differential responses of their students to droughts. The extreme dependence on rain-fed agriculture for employment and income during this period in India supports the focus on drought as a proxy for an exogenous decline in local real incomes.

I treat the interaction of droughts with the training regime of each collector as a plausibly random event.[33] My reduced form estimation strategy measures the differential effects of training, net of all prior or subsequent training, experience, and information the bureaucrat accrued during their career. My identification strategy compares Malthusian and Jonesian responses to drought, holding constant permanent district characteristics and common time-varying trends across districts.[34] The identifying variation in this empirical approach comes from two sources: firstly, the variation within a district, across the years during which it experienced drought; secondly, the variation across districts experiencing drought, within the same year.

[32] Famine intensities across the two sources are more similar, with an average Gazzetteer intensity of five percent and Srivastava intensity of eight percent, likely suggesting that Srivastava (1968) simply chose to include more modestly-affected regions than did Nathan et al. (1909) in defining famine incidence.

[33] This approach is appropriate if, after conditioning on the fixed effects and included controls, both drought and assignment to training regime are exogenous. Identifying assumptions are discussed further in the relevant section.

[34] Another intercept term holds constant average differences in collector or district characteristics across training regimes in the panel.

4.1 Specification

I employ a log-linear specification to recover differences in relative intent-to-treat effects on policy responses during drought:

$$y_{dt} = \exp\Big(\delta_1 \,\text{drought}_{dt} + \delta_2 \,\text{Malthusian}_{dt} \times \text{drought}_{dt} + \delta_3 \,\text{Malthusian}_{dt} + \delta_4 X_{dt} + \lambda_d + \gamma_t + \epsilon_{dt}\Big) \tag{1}$$

where y_{dt} denotes the outcome variable in the district d and year t, drought_{dt} denotes whether the district experienced a drought, Malthusian_{dt} denotes whether a Malthusian collector was assigned to the district, X_{dt} is a vector of controls which is often null, and λ_d and γ_t are fixed effects at the district and year level, respectively.

I also employ a linear model:

$$y_{dt} = \delta_1 \,\text{drought}_{dt} + \delta_2 \,\text{Malthusian}_{dt} \times \text{drought}_{dt} + \delta_3 \text{Malthusian}_{dt} + \delta_4 X_{dt} + \lambda_d + \gamma_t + \epsilon_{dt} \tag{2}$$

with identical notation to Equation 1. I make use of the linear model to test characteristics for balance and for recovering percentage-point coefficient estimates in the case of binary outcomes or probabilities.

For additional outcomes of interest, I estimate those without zeros from Equation 1 via OLS in logs, and for outcomes of interest with zeros I estimate a Poisson pseudo-likelihood regression of Equation 1 in levels as well as Equation 2 via OLS in levels as a robustness check.

4.2 Identifying assumptions

The primary assumption for identification is a standard assumption about the absence of omitted variables bias:

$$E[\epsilon_{dt} \mid \text{Malthusian}_{dt} \times \text{drought}_{dt}] = 0$$

which is met if the interaction of droughts with incidental exposure of bureaucrats to each training regime is as good as random. An ideal experiment would assign these randomly: both (1) the initial assignment to training and (2) subsequent assignment to districts during drought.

The primary threat to identification is that that other policy determinants may have been correlated with the first source of variation, assignment to training. Given the cohort-level nature of assignment

to training, the main challenge involves distinguishing the effect of training from other cohort-varying characteristics which might also determine bureaucrat responses to drought. These could include various academic, cultural, or political factors which might alter bureaucrat attitudes towards poverty, charity, and government intervention. Another threat is that the characteristics of the district may have changed over time, such that droughts translated into greater or lesser demand for government assistance agnostic of bureaucrat training or attitudes towards poverty and intervention. A threat to the second source of variation, assignment across by training regime to drought districts, is that bureaucrats could have been strategically allocated due to effects of their training on their expected performance. However, I argue that this is of minimal concern empirically due to the combination of strict adherence to seniority-based promotions in the Indian Civil Service along with the cohort-level nature of the treatment.[35]

To support identification, I test balance of various district and collector characteristics by estimating δ_2 from Equation 2 via OLS. Figure 2 summarizes the coefficients obtained from this regression after standardizing each of fourteen various collector and district characteristics.[36] These variables include the location of birth of the collector, their age and years of experience in the year of the panel observation, their age at which they entered the civil service, number of academic awards that they earned at Haileybury, whether they were entrusted with magistrate powers, and the presence of a railroad in the district-year. All of these coefficients are indistinguishable from zero at a significance threshold of $\alpha = 0.05$ and only one variable (age) differs from zero at $\alpha = 0.10$, in line with what would be expected by chance.[37] The average coefficient is small, with the coefficient on age indicating Malthusians who observed drought in the panel were just one year older than Jonesians, and all coefficients lie roughly within one-fifth of a standard deviation of zero. I interpret these results as support for the conclusion that Malthusian and Jonesian collectors facing drought did not have systematically different demographic background, abilities, authority, or face different transportation costs while orchestrating government responses to drought.

If there is no bias arising from omitted variables, then $\hat{\delta_2}$ in Equation 1 and Equation 2 is identified provided that the regression equation imposes the correct CEF.[38] I address threats further by

[35] In this setting, junior cohorts gradually fill into the roles vacated by senior cohorts.

[36] Table A1 reports the same coefficient estimates for all fourteen district and collector characteristics (without standardizing), alongside the mean and standard deviation of each characteristic in the sample.

[37] Given that Malthusians are older and more senior than Jonesians in every year in the panel, it might be expected that droughts observed under Malthusian collectors would be more strongly predictive of higher age and experience. However, due to the adherence to seniority-based promotions, and the assignment to districts rigidly based on the seniority of the bureaucrat, the district fixed effects absorb much of the differences in experience and age, so that there is little left over which could also be differentially correlated with drought.

[38] In the case of logged outcomes, identification also requires that the error term ϵ_{dt} is homoskedastic (Santos Silva and Tenreyro, 2006). Equation 1 and Equation 2 recover the average treatment effect net of all subsequent information, skill, etc. accrued over the course of their career; in the results section, I also explore treatment heterogeneity along observable district and collector characteristics which may have augmented or attenuated the treatment.

introducing kernel weights in a second empirical approach, centered around cohorts which entered the college just before or after Malthus died. If the timing of the death of Malthus is random, then the assignment to training for cohorts entering within a narrow bandwidth of his death mimics a truly randomized assignment. Identification in this case relaxes the demand for balance of other policy determinants be balanced outright in favor of continuity across cohorts.[39]

My empirical approach focuses on bureaucrat responses to droughts – abrupt, low-income episodes – in an effort to isolate the influence of the contradictory explanations of distress (and of the power of relief measures to resolve it) advanced by Malthus and Jones. While qualitative evidence suggests that this was the dominant difference in instruction, a limitation of this study is that other factors may still have varied across instructors.[40] I note that measurement of the effect of economic ideas is inherently difficult, as experiments designed to answer this question may not meet ethical standards and observational studies of modern economics training may be contaminated by the inclusion of training in skills such as optimization or econometrics.[41] A strength of the setting I study is that these potential threats did not exist as a part of the methodology of economics at the time, supporting my interpretation of $\hat{\delta}_2$ as the relative effect of differences in exposure to ideas under each instructor during training.

4.3 Rainfall shortages as a proxy for income shocks

Panel A of Table 3 presents OLS estimates of the effect of drought on prices and famine incidence. Droughts are associated with a statistically significant increase in food-grain prices, with average prices rising by over two percent (column 1), and by nearly five percent for the four grains with the highest calories per rupee (column 2). The larger price increases for inferior grains suggest that households substitute towards cheaper, higher-calorie foods during droughts, consistent with a

[39] Because this places the greatest weight on cohorts who entered the college at nearly the same time, and because of the practice of promotions on the basis of seniority, this approach will hold constant arbitrary trends in characteristics across cohorts and time-varying trends in district characteristics. The residual threat to this approach is that some other policy determinant may have changed discretely, rather than continuously, and may have also affected the response to drought.

[40] Other factors which may have also changed include the overall quality of instruction or the encouragement of certain political preferences, though these may represent part of the treatment effects of the ideas themselves. To the extent that some ideas may have a stronger logical or empirical foundation, then differences in the quality of instruction with respect to these ideas may be inseparable from the ideas themselves, and therefore would not threaten this interpretation. The same argument can be extended to political preferences; to the extent that ideas might support some political perspectives over others, this type of persuasion would represent a legitimate component of the treatment effect of exposure to ideas.

[41] Experiments which examine whether exposure to economic ideas affects relatively unimportant government policy may be internally valid and meet ethical standards, but their external validity with respect to high-stakes bureaucrat decisions would not be obvious. Experiments expected to alter important policies, such as those with consequences for hunger or mortality, would likely face ethical constraints. I note that this setting offers a close approximation to this second type of ideal experiment.

decline in real incomes.[42]

In line with the suggestive evidence from prices, I find that droughts increase the probability of famine being reported by Nathan et al. (1909) in the district-year by six percentage points (column 3), and in Srivastava (1968) by twelve percentage points (column 4). Both estimates point to the likelihood of famine rising by one-third of a standard deviation during drought, strongly supporting the focus on drought as a proxy for real income declines and an abrupt increase in local economic distress.

For robustness, I also investigate responses to negative rainfall shocks. I define these shocks as:

$$neg\text{-}shock_{dt} = |min\{0, rain\text{-}SD_{dt}\}|$$

which captures both the incidence of adverse agricultural conditions, as well as their intensity, with larger values capturing more severe rainfall shortages. This measure is similarly predictive of high prices and a higher probability of famines, as shown in panel B of Table 3. The results look very similar to those for droughts, with each standard deviation shock raising prices by two percent on average (column 1), and by more than four percent for the four food-grains with the highest energy density per rupee (column 2). Negative rainfall shocks also raise the probability of famine being reported in Nathan et al. (1909) by four to five percentage points (column 3) and in Srivastava (1968) by nearly nine percentage points (column 4) per standard deviation.

5 Results

5.1 Tax write-offs

In examining the policy responses of bureaucrats, I focus first on their tax write-offs, the only fiscal policy which was consistently recorded across all of the provinces governed by the Indian Civil Service during this time period. Due to the high frequency of zeros in the data (25 percent) and long right tail, I estimate Equation 1 first by Poisson pseudo-likelihood regression (PPML) (Correia et al., 2020), which recovers coefficients in log points.[43]

[42] I refer to these grains as inferior because they trade at a discount, on average, relative to other food-grains in terms of their average calories-per-rupee density in the sample. I also note that these price effects likely understate the true impact on households, as the reported prices are district-level averages from the largest markets and may not fully reflect sharper increases in rural or remote markets, where adverse effects on prices and incomes were more likely to be concentrated.

[43] This estimator has the advantage of both accommodating zeros in the outcome variable and also relaxing the homoskedasticity assumption required for unbiased estimation of Equation 1 by OLS in logs (Santos Silva and Tenreyro, 2006).

Coefficient estimates are reported in panel A of Table 4; PPML points to an imprecise ten log point increase in write-offs by Jonesians in response to drought, while write-offs under Malthusians are thirty-two log points lower (models 1 and 2). The magnitude of these relative differences is even larger when estimating Equation 2 in OLS, and corroborates the qualitative conclusion from PPML; Malthusian collectors reduce tax write-offs in response to drought to the tune of up to 15,000 rupees (models 3 and 4). Overall, relative to Jonesian collectors, the results indicate that write-offs under Malthusian collectors are between 12,000 and 14,000 rupees lower during droughts.

Panel B of Table 4 presents robustness checks for the same specification with negative rainfall shocks in place of drought. The coefficient estimates are even larger in this case; Jonesians respond by increasing write-offs (model 2) or at least not reducing them (models 1, 3 and 4); by contrast, Malthusians reduce tax write-offs write-offs by nearly thirty-five log points relative to Jonesians (models 1 and 2), or close to 17,000 rupees less (models 3 and 4) per standard deviation shock. These results indicate that Malthusian responses may have been even harsher than their Jonesian counterparts during more severe local rainfall shortages.

The average differential contraction in write-offs by Malthusians across all models in Table 4 is approximately 14,000 rupees. A back-of-the-envelope calculation suggests that, at average prices, this quantity of tax relief could have fed roughly 15,000 people for two months[44] and could have substantially offset real income losses and curbed hunger in a the worst-affected agricultural communities.[45] During a more extreme, two-standard deviation shortage of rainfall (the 99th percentile of rainfall shocks), estimates from Table 4 suggest that the differential contraction in write-offs by Malthusians could have fed even more, meeting the caloric needs for up to 33,000 people for two months.

5.2 Extensive margins of common interventions

In addition to the explicit fiscal policies that I observe, I also examine the probability that various types of anti-famine measures were implemented in the district-year. I impute these probabilities from the famine accounts discussed in the Imperial Gazzetteer (Nathan et al., 1909) for each district. These passages describe episodes of famine and discuss government measures undertaken in response; I obtain probabilities of intervention imputed by a neural network for each of several measures, such as food imports or the opening of government works, as described in the data appendix. I use these extensive-margin probabilities to complement the limited financial records

[44]This figure assumes subsistence calories of 1,500 per person per day, and 100 percent consumption in the highest calorie density per rupee commodity, ragi, at 98,000 calories per rupee.

[45]The average district population for the four sample provinces at the time of the 1881 census was one million and forty thousand.

that I do observe during this period.[46]

Table 5 reports estimates of Equation 2 via OLS for each of four types of government intervention: government works, gratuitous relief, food imports, and government advances. Across all interventions, I find a higher probability of these measures being implementing during droughts under Jonesian collectors, with a negative and often statistically significant relative decline in the probability of intervention under Malthusians. Government works have the largest relative differences, with textual passages more than two percentage points less likely to mention government works during droughts under Malthusians relative to Jonesians (column 2). Government advances also seem to be less likely, with the Gazzetteer text close to two percentage points less likely to discuss these interventions under Malthusian droughts (column 4). The text-imputed probabilities of food imports and gratuitous relief are also lower under Malthusians, by two-thirds and four-fifths of a percentage point (columns 3 and 2, respectively). In standard deviation terms, the largest effects are for government works (one-fourth SD), followed by government advances and tax relief (one-fifth SD), and then food imports and gratuitous relief (one-tenth SD), which suggest a modest reduction in the probability of Malthusians implementing each of these interventions, relative to Jonesians. Perhaps most notable, however, is that the evidence from these textual accounts indicates that Malthusian collectors do not seem to have been merely substituting from one form of relief to another, but were instead reducing total government assistance and responsiveness to local distress.[47]

5.3 Public expenditures

I turn next to examining relative differences in government expenditures on public works. According to the records compiled by Indian Famine Commission (1880), these measures comprised a major component of government relief during famines, with qualitative accounts describing that local officials opened public works in regions affected by drought and famine in order to raise employment rates and local incomes.[48] From the imputed intervention probabilities, I found that

[46] While I measure these probabilities only from textual accounts in Nathan et al. (1909), I validate these metrics in Table A10; I find that the probability of all interventions are higher during drought and also during famines as measured from the maps in Srivastava (1968). The coefficient estimates in Panel A suggest droughts increase the probability of all four types of intervention by between one-tenth and one-fourth of a standard deviation during droughts, and by up to one full standard deviation during famines from Srivastava (1968) (models 5 and 8).

[47] While these figures are not large in absolute terms, they do point to the same conclusion as the evidence from tax write-offs: that Malthusian collectors were less likely to intervene during droughts. These textual accounts likely also measure these interventions with much more noise than the data on tax write-offs, as they are based on qualitative accounts rather than systematic records. The presence of this additional measurement error means that many of the coefficients reported in Table 5 may be substantially attenuated, and therefore that Malthusian collectors may have been even less likely to intervene than implied by these figures.

[48] These claims are corroborated by the quantitative evidence; Table A10 demonstrates that government works were more likely to be implemented during droughts and famines.

government works were one of the most differentially implemented interventions between Jonesian and Malthusian collectors during droughts. I am able to investigate these responses from a district-level panel published for the province of Madras.

Table 6 reports coefficients from this panel, estimated from Equation 1 in logs with OLS. The results are largely in the same direction as the evidence on tax write-offs and imputed intervention probabilities. Central estimates imply that total public works expenditures don't rise substantially under Jonesian collectors during drought, though they may fall by up to 13 percent under Malthusian collectors (column 1). Columns two through four report differences for the subset of the panel with disaggregated expenditures records on new works versus expenditures on the repairs of existing works. These additional records are informative because new works could be opened to target the most crisis-stricken regions, a common practice during this period. I find the largest relative differences in spending on new works (column 3), corresponding to a thirty percent contraction in expenditures on new works under Malthusian collectors relative to Jonesians during drought. Estimates are somewhat higher for total expenditures overall in this subsample, with a more than 20 percent relative contraction in expenditures overall (column 2), and a 25 percent relative contraction in repairs (column 4), corroborating the direction of the coefficient in the full panel (column 1).

Despite the limited sample and power in this panel, the results indicate that differential contractions in public works expenditures may have comprised an important additional channel along which the policy responses of Jonesian and Malthusian collectors varied and corroborate the evidence from extensive-margin intervention probabilities. Compared to the estimate that the missing tax relief under Malthusians would have fed up to 15,000 people for two months, the same back-of-the-envelope calculation suggests that Malthusian contractions in public expenditures could have fed up to 25,000 people over the same period, or around two to three percent of the average district population in these provinces at the time of the 1881 census. These figures are surprisingly stable across columns (1), (3), and (4), with each implying a roughly 25,000 rupee contraction in public works spending. The evidence from public expenditures points to the same conclusion as the evidence on tax write-offs and intervention probabilities: that relief policies of Malthusian collectors during drought were harsher than under Jonesians, and that these collectors were not merely reallocating resources to other forms of relief, such as public works, but were instead reducing the overall quantity of government assistance.

5.4 Bureaucrat performance

In order to examine which policy responses may have been preferred by government leadership, I examine measures of bureaucrat performance. In a principal-agent framework, agents make decisions which may not be perfectly monitored by principals, but which determine end-stage

payoffs to the principal. Little is known about how training can affect this alignment. In this section, I examine the evidence from a binary measure of collector performance commendations, evaluated by provincial authorities at the end of each year, to investigate whether one of the training regimes may have better aligned collector responses to drought with the objectives of principals.[49]

Panel A of Table 7 presents coefficient estimates of Equation 2, a linear probability model for this measure of bureaucrat performance during droughts. The central estimates suggest that Jonesians are an imprecise five to eight percentage points more likely to be commended during drought, while Malthusians were around eight to thirteen percentage points less likely to be commended for their performance than Jonesians. On average only around one out of every four collectors is commended in a given year, so that even an eight percentage point reduction is a large effect, though it is statistically imprecise (models 1 and 2).

Panel B of Table 7 presents the same estimates for negative rainfall shocks. The results are similar in magnitude, but the standard errors are much smaller, with Jonesians up to four percentage points more likely to be commended per standard deviation shock, while the probability of Malthusians being commended declines by eight to thirteen percentage points per standard deviation shock, relative to Jonesians (models 3 and 4), and with one coefficient meeting standard significance thresholds to reject a null effect.

To investigate this further, Table A4 presents estimates of Equation 2 for different bins of negative rainfall shocks, in half-standard-deviation increments. During lower-intensity shocks, the probability of Jonesian commendations rise by a small amount, ranging from one to four percentage points, before sharply rising to an imprecise fifteen percentage point increase in the probability of commendation during the most intense rainfall shortages (i.e., those that were at least one and a half standard deviations below the district mean). By contrast, Malthusians are consistently rated worse across all shock magnitudes, though imprecisely at low intensities. The probability of Malthusians being commended falls by an imprecise four to twelve percentage points during low-intensity rainfall shortages, before sharply falling by up to thirty-six percentage points during the most severe shocks. The magnitude of this effect is extremely large, with the reduction in probability of being commended ranging from fifty to ninety percent of a standard deviation.

At a minimum, these results indicate that Jonesian collectors, who provided greater tax relief, were not acting against the interests of principals. Moreover, these results are consistent with Malthusian responses to poverty being misaligned with the objectives of principals, inviting the disapproval of superiors after the year ends and payoffs are realized.

[49] This subjective performance evaluation is the only measure of bureaucrat performance available for this period.

5.5 Heterogeneity by academic ability of collector

An additional advantage of examining the influence of economic ideas in this setting is that consistently-measured proxies for bureaucrat ability are readily available from the records in Danvers et al. (1894). I explore the tax relief responses of collectors by the number of academic awards they won while enrolled at Haileybury. Table 8 reports these coefficient estimates from a minimal extension to the empirical specification, adding an interaction with the number of awards won:

$$\begin{aligned} y_{dt} = \exp\Big(& \beta_1 \, \text{drought}_{dt} + \beta_2 \, \text{Malthusian}_{dt} \times \text{drought}_{dt} \\ & + \beta_3 \, \text{Malthusian}_{dt} \times \text{drought}_{dt} \times \text{awards}_{dt} + \beta_4 \, \text{awards}_{dt} \\ & + \beta_5 \, \text{Malthusian}_{dt} \times \text{awards}_{dt} + \beta_6 \, \text{drought}_{dt} \times \text{awards}_{dt} \\ & + \beta_7 \, \text{Malthusian}_{dt} + \beta_8 \, X_{dt} + \lambda_d + \gamma_t + \epsilon_{dt} \Big) \end{aligned} \tag{3}$$

The columns successively interact for different types of awards: either the total number across all classes (column 1), the number of awards won in courses on South Asian languages (column 2), in economics (column 3), or in mathematics (column 4). I estimate Equation 3 with PPML and find a consistent pattern that the differences in response of Malthusian and Jonesian collectors are driven by differences across collectors of lowest ability. Malthusians in the fifth percentile of the number of awards won (i.e., those who did not win awards in any of the four categories) write off between thirty-seven and forty-seven log points less than their Jonesian counterparts during droughts (columns 4 and 3, respectively). Meanwhile, the responses between Malthusian and Jonesian collectors at the 95th percentile of awards are statistically indistinguishable from one another. It is notable that this pattern emerges even for awards issued in economics, which would have been determined by Malthus himself, suggesting that his highest-performing students were the least susceptible to the long-term influence of Malthusian training on their policy responses.[50]

[50] These results imply that bureaucrats with high ability may have been less likely to rely on their economic training for policy-making than their lower-ability counterparts. Several potential explanations for this pattern are possible. It could be that high-ability bureaucrats felt more confident relying on their own judgment, or that they required a greater evidence threshold before adopting new ideas or incorporating them into practice. High-ability bureaucrats may have updated their beliefs or incorporated new information at a faster rate, in which case they may have converged to similar posterior beliefs faster than low-ability bureaucrats. It could also be that high-ability bureaucrats better understood the nuances of the theory and were therefore more aware of its weaknesses; lower-ability bureaucrats may not have understood various qualifications or limitations, such as the details of the underlying assumptions or of the data which supported them. For example, those with a firm grasp of the Malthusian perspective may have noticed the extremely limited evidence from South Asia in his writing, and may have doubted its applicability to the Indian context as a result. This explanation would resonate with the perspective of Solow (1989), who noted how economic ideas invoked to justify decisions often "bear little resemblance to the original ideas ... [s]ubtleties evaporate, including important subtleties, and qualifications disappear altogether." Other explanations may also be possible, but I am unable to pinpoint which might be truly responsible for the observed pattern.

Another important point is that this pattern emerges across cohorts while awards were earned *within* cohort, inconsistent with the potential threat that average Malthusian responses are contaminated by correlation with cohort-varying characteristics, and offering further evidence that the observed average differential responses to scarcity were indeed due to differences in bureaucrat training.

5.6 Heterogeneity by authority and discretion of collector

Table 9 reports estimates of Equation 3, interacting with various proxies for collector authority and discretion instead of awards. These variables are the land tenure system of the district (column 1), magistrate powers (column 2), the number of years of experience in the civil service (column 3), and the size of the district in hundreds of square kilometers (column 4). The land tenure system is a binary variable which indicates whether the district was governed under the zamindari system, in which the collection of government taxes was entrusted to local landlords (zamindars).[51] Contracts with local landlors mandated a fixed, annual revenue stream to government and therefore left no room for collector discretion in writing off taxes. In landlord districts, I find no difference in tax write-offs during droughts between Malthusian and Jonesian officials (column 1). Instead, all of the relative differences in tax write-offs are driven by districts in which British officials coordinated tax collection themselves, where they held discretion over write-offs.

I next consider additional authority granted to the collector in the form of magistrate powers. The magistrate controlled the police, criminal courts, and jails; in some British districts the offices of collector and magistrate were not unified until after 1858, while in others they were unified over the entire period of study. I find that Malthusian responses only diverge from those of Jonesians in district-years during which the collector was entrusted with these additional powers, with estimates indicating that Malthusians with magistrate powers write off thirty-one log points less than Jonesians (column 2). This result implies that the additional authority, when granted to Malthusians, may have allowed them to implement harsher policies during droughts.[52]

I also consider the number of years of experience in the civil service, which captures bureaucrat seniority. The average differences across Jonesian and Malthusian responses could be explained by more junior bureaucrats if, for example, all bureaucrats update their information over their career and converge to the same posterior. Alternatively, these differences could be due to the actions of more senior Malthusians, who are assigned to larger and more important districts or have developed skills which could increase their ability to direct local subordinates. I find that the

[51] In other districts, British government officials collected taxes directly from cultivators or villages.

[52] This might have been due either to increasing their power to enforce tax compliance, increasing their authority in directing the efforts of subordinate bureaucrats, or else simply by removing another local official who might have occasionally discouraged or disrupted Malthusian policies.

more senior bureaucrats are responsible for the average deviations from Jonesians; column 3 of Table 9 shows that bureaucrats in the 95th percentile of experience (thirty years) contract write-offs by nearly sixty-five log points relative to equivalently experienced Jonesians. These are the largest differences across any subgroup of collectors, and suggest that senior Malthusians used their greater authority, discretion, or skill to implement increasingly harsher policies while junior Malthusians in less influential positions or of lower skill may have been constrained in the extent of their authority to do so.

Finally, I consider the size of the district in hundreds of square kilometers as a proxy for bureaucrat discretion. Larger districts were assessed greater land tax demands, and therefore a larger pool of taxes to which the collector could make adjustments. Larger districts also had more officials whose efforts could be directed by the collector towards their prescribed policies. I find that larger districts are responsible for larger relative contractions in tax write-offs by Malthusians in column 4 of Table 9: by forty-three log points for Malthusians in districts at the 95th percentile of district area (22,000 square kilometers).

Malthusians with greater authority and discretion were therefore more likely to implement harsher policies during droughts than their Jonesian counterparts. Malthusians in districts where tax collections were contracted to local landlords, assigned to less important and smaller districts, or without magistrate powers are statistically indistinguishable from Jonesians. This is consistent with the conclusion that Malthusian bureaucrats were more likely to implement harsher policies as their ability to enforce them grew.[53]

6 Robustness

In this section, I examine the robustness of the main results to kernel-weighted specifications and alternative sample restrictions in an effort to eliminate potential biases which might be driving the results. The purpose of these robustness checks is to ensure that the results are not driven by biases which may confound the estimates, and to confirm that the coefficient estimates are in line with those from the full sample, though these exercises will necessarily inflate the standard errors and raise the probability of incorrectly failing to reject a false null hypothesis. I also report hypothesis tests for several placebo outcomes, which offer additional evidence against potential biases and are fully powered to test against the null hypothesis.

[53] One additional explanation for this apparent emergence of latent underlying attitudes is that senior Malthusians may have felt that they were less likely to face adverse personal consequences as they approached retirement, and especially if they did not expect to be promoted into the higher ranks in the civil service.

6.1 Kernel weighted specifications

One threat to identification is that unobserved, time-varying trends in district characteristics may have been correlated with the transition from Malthusian to Jonesian administration, or that cohort-varying trends in the types of students entering Haileybury may have been correlated with the transition from Malthusian to Jonesian instruction.[54] To address this concern, I estimate kernel-weighted PPML and OLS specifications at various bandwidths (in years), based on the year the collector began their studies at Haileybury. I center these kernel weights on those cohorts who entered the civil service just before or after the death of Malthus, so that as bandwidths decline the assignment of cohorts to each instructor approaches a truly randomized assignment. Importantly, this procedure relaxes the assumption that other determinants are balanced across training regimes during drought in the panel outright, in favor of the assumption that these determinants merely vary continuously across cohorts.[55]

Figure A4 presents the estimates of the interaction coefficient from these specifications, with the bandwidth in years on the x-axis and the coefficient estimates on the y-axis, along with their 90% confidence interval. The results are largely consistent with the main results; Malthusians write off fewer taxes during droughts than Jonesians across all bandwidths, and this effect is very stable at close to thirty-five log points (100% of the full sample result). The relative differences in all but one of the intervention probabilities are also very similar or larger in magnitude at the lowest bandwidths; at a bandwidth of two years, the probability of government works during drought is less under Malthusians (100% of full sample result, subfigure b), as are the probabilities of gratuitous relief (600% of full sample, subfigure c), and government advances (200% of full sample, subfigure e). Only the probability of food imports (subfigure d) seems to be unstable and inconsistent with its direction in the full sample, jumping at or above zero at low bandwidths.

The estimates are somewhat noisier than in the main sample, especially at low bandwidths, though this is likely due to the lack of power. However, the coefficient estimates largely support the main findings, and on average suggest even larger effects than those estimated from unweighted specifications.

[54] These trends could bias the results by violating the critical assumption that other determinants of government relief measures are balanced across training regimes during drought.

[55] This approach allows for arbitrary trends in any time-varying district or cohort characteristics. By comparing relative differences in the responses of collectors who were both studying at Haileybury at nearly the same time and assigned to districts at nearly the same time, the continuity assumption implies that differences in policy determinants are expected to approach zero, so that any remaining differences in policy responses are due only to differences in training.

6.2 Mixed administration period

In a further attempt to isolate the influence of training, I restrict to a shorter time period, limiting the extent to which changes in the political or economic context may have diverged. I condition on the period with a mix of both Malthusian and Jonesian collectors, covering the range of years from the point when the first Jonesian appears in the data (1846) until the last year with at least one active Malthusian collector (1870).[56] Table A8 reports the coefficient estimates for this subsample.

Panel A reports estimates of Equation 1 for relative responses to droughts, and I find estimates which yield smaller coefficients for some outcomes, and larger coefficients for others, but largely in line with the full sample results. Malthusians issue fewer write offs droughts than Jonesians (60% of full sample result, model 1), and are less likely to intervene across all outcomes: governent works (65% of full sample, model 2), gratuitous relief (185% of full sample, model 3), food imports (140% of full sample, model 4), and government advances (50% of full sample, model 5).

Panel B reports estimates of Equation 1 for negative rainfall shocks to similar effect; the estimates are very close to or larger than those from the full sample. Malthusian write-offs per standard deviation shock are slightly lower (80% of full sample result, model 6), as well as the probabilities of government works (90% of full sample, model 7) and government advances (80% of full sample, model 10), while gratuitous relief (145% of full sample, model 8) and food imports (145% of full sample, model 9) are larger. Overall, these relative differences are consistent with the main results, suggesting that the full-sample estimates are not biased by other time-varying district characteristics which changed over the course of the study period.

6.3 Company and crown rule

A potential concern is that the observed results may not reflect the effect of training on collectors' discretion or effort, but could instead arise due to aggregate changes in the political system. The most substantial during this period was the transfer of administration from the East India Company to the British Crown. This transition could have coincided with (i) a reorganization of the administrative system within the district, (ii) government investments in infrastructure which alter the sensitivity of income to drought, or (iii) shifts in policy directives issued by government leadership. I address each of these potential threats in turn.

The greatest change in district administration associated with this transition was the combination of the offices of magistrate and collector in many districts after 1858, while the most substantial change in infrastructure investments was the expansion of the railroad network. I show that both

[56] This sample restriction excludes close to six-hundred district-years with Jonesian collectors, over the period from 1871 to 1885, compared with the full sample.

of these district characteristics are balanced in Table A1, and I also show that the results are highly robust to inclusion of these and all other collector and district characteristics in Table A5. I do not observe additional types of infrastructure investments, such as the increased investments in canal networks which also took place during this period, though these investments would have likely only reduced local demand for government relief during drought, and therefore would not explain why collectors during this later period provided more relief.

To test for changes in policy directives, I split the sample around two key events: the 1853 Charter Act and the 1858 dissolution of the East India Company.[57] I begin by presenting the results before and after 1858, as reported in Table A6. Panel A reports the coefficient estimates under company rule; tax write-offs are imprecise but much larger under Malthusians during drought than Jonesians, and differences in intervention probabilities are null, though these estimates more likely reflect a lack of sufficient variation across both groups than a truly null treatment effect.[58] Panel B of Table A6 presents the results under crown rule; there is much more variation in this subsample than in panel A, but generally smaller effects than the full sample, with only tax write-offs and the probability of opening government works or importing food suggesting a similar relative contraction.[59]

However, it may be more appropriate to restrict to the period following the Charter Act of 1853, as some historians trace the beginning of Crown Rule to this period, when the East India Company "was relegated to nothing more than a managing agency for the administration of India subject to the British government's direction in matters of policy" Spear (1956, p. 148). This subsample, during which the principal of the colonial administration was, by statute, the British Crown, contains almost every year during which both collector types were assigned to districts. I report the results for this subsample in Table A7.[60]

Panel A of Table A7 presents estimates of Equation 1 for relative tax write-offs and intervention

[57]The Charter Act stripped the East India Company of its profit incentive, replacing its shareholders' claims on profits with a fixed dividend, while also replacing much of its leadership with appointees of the British Crown, and authorizing the East India Company to administer the government of India only in trust for the British crown. The second of these occurred in 1858, when administration by the East India Company was dissolved outright and any remaining leadership replaced with appointees of the British Crown.

[58]There are very few droughts under Jonesian collectors during this period (18 out of 686 observations), and minimal little variation in the imputed probabilities of intervention (mean nearly or exactly zero). Records from Bombay province, for example, are not even available until 1860. This very narrow period also introduces compositional changes which may explain the lack of observed differences in responses. The heterogeneity results indicated that most of the differences are observed across Malthusians and Jonesians with the highest levels of experience; in this subsample, Jonesians are in the earliest years of their careers, and therefore these compositional changes in the subsample may explain the lack of observed differences in their responses.

[59]The magnitude of relative write-offs by Malthusians during drought is roughly two-thirds of that in the full sample (model 6), the probability of government works is 40% of that in the full sample (model 7), and the probability of food imports is 85% of that in the full sample (model 9).

[60]I do not examine the period before 1853 due to the extremely minimal variation across collector training regimes in this subsample, as well as lack of data overall (no data from the provinces of Madras and Bombay, for example).

probabilities during droughts, and Panel B of Table A7 reports policy responses to negative rainfall shocks. The relative differences in responses are largely in line with those from the full sample, and in some cases are even larger.[61] As with the results from the mixed-administration period, the relative differences in responses across Malthusians and Jonesians are consistent with the main results, and largely support the conclusion that the full-sample estimates are not confounded by a change in the objectives of government principals during this period.

6.4 Placebo outcomes

I test several placebo outcomes relating to either the potential for writing off taxes, or else to non-government intervention during drought. Firstly, the land tax records report the annual total outstanding liabilities for each year, based on the assessments of plots under cultivation in each district; these tax demands represent the pool of tax liabilities to which the collector could potentially make adjustments, and are fixed in the short-run. Adjustments to these tax assessments were undertaken only as outstanding assessments expired or new land was brought under cultivation, and therefore should not vary across collector types during drought. Secondly, the passages discussing famines in Nathan et al. (1909) sometimes refer to private measures undertaken by non-government entities; I test whether these probabilities vary across Malthusians and Jonesians during droughts. If the collector has no influence over these measures, as they should not, then these interventions should not vary across collector types during drought.[62] Reassuringly, I find no relative differences in tax demands or in the probabilities of private interventions during drought across any of the private intervention labels reported in Table A9 (columns 1 through 4).

7 Discussion: achieving modern policy goals

In light of the evidence, I consider the implications of the empirical results in the context of modern bureaucracy. The results suggest that bureaucrats face uncertainty about the economic forces which could either undermine or augment their efforts towards achieving a particular policy

[61] Malthusians write off thirty-three log points less during droughts than Jonesians (100% of full sample result, model 1), in line with the results from the imputed probabilities of government intervention: government works (90% of full sample, model 2), gratuitous relief (55% of full sample, model 3), food imports (110% of full sample, model 4), and government advances (55% of full sample, model 5). I also find a similar magnitude for relative differences in responses to rainfall shocks: for write-offs (100% of full sample result, model 6), govenent works (90% of full sample, model 7), gratuitous relief (90% of full sample, model 8), food imports (100% of full sample, model 9), and government advances (85% of full sample, model 10).

[62] Any differences across these outcomes might also suggest that there were differences in the residual demand for government intervention which could potentially bias the full-sample results, and any differences in the size of outstanding land tax liabilities would have given collectors a larger pool of potential tax revenues to which they could make adjustments.

outcome. In my setting, these are concerns about the potential for government intervention to truly limit economic distress, as bureaucrats worry that relief which could directly supplement incomes might also indirectly reduce them by disrupting the checks to population outlined by Malthus, leading bureaucrats to expect their efforts to be less effective and therefore to provide less relief.

This explanation is consistent with many historical episodes involving sudden changes in the type of decisions made by bureaucrats, such as the influence of the spread of Keynesianism on government policy during recession (Hall, 2020), or of the influence of laissez-faire ideas on the policies enacted by the Chicago Boys (Edwards, 2023), or the effect of economics training on the rulings of U.S. federal judges (Ash et al., 2025). Modern bureaucrats face many similar types of tradeoffs in weighing the merits of various policies, and the results imply that the economic ideas to which they have have been exposed will materially affect their provision of public goods or services.

For bureaucrats entrusted with substantial discretion, training would offer one way to encourage alignment of bureaucrat decisions with the principal's policy goals. In modern bureaucracy, those with the greatest influence over policy outcomes are senior bureaucrats, often appointed by political principals.[63] The evidence from this study suggests that the treatment effects of training these senior bureaucrats would be large. Moreover, if these appointments are determined by personal or political loyalty tests to principals, rather than academic ability, then these bureaucrats may be even more responsive to training.[64]

Many recruitment strategies rely on competitive examinations to select candidates of generally high academic ability into the civil service, and this study suggests that one potential benefit of this selection mechanism is that candidates selected through this process may be less influenced by incidental exposure to ideas. These types of recruitment strategies might therefore serve to insulate bureaucracy against the arbitrary influence of trending economic ideas, such as those which have suddenly become popular among the general public. Selection based on characteristics correlated with academic ability would therefore reduce the risk that bureaucrats might be persuaded by these ideas. One drawback, however, is that these candidates may also be less responsive to training, so that principals who intend to influence the behavior of these bureaucrats may get more mileage from other strategies, such as changing their incentives.

Economists study bureaucracy in part due to the perceived inefficiencies that arise from misaligned

[63] It is difficult to study performance among these bureaucrats because there are relatively few of them, and obtaining the statistical power to measure how various factors shape their decisions or determine final policy outcomes is difficult. I am able to address this challenge by examining a context where discretion and authority were concentrated in the hands of a large number of decentralized, geographically dispersed bureaucrats.

[64] Many modern bureaucracies select bureaucrats based on proxies of academic ability, such as competitive examinations; the results suggest that this insulates the bureaucracy from the influence of ideas among the rank-and-file. If senior bureaucrats are selected for personal or political loyalty, agnostic of or only weakly correlated with academic ability, the results imply that training delivered to political appointees would likely have an even larger effect.

incentives and information asymmetries characteristic of these organizations. A common concern is that the private objectives of bureaucrats might distort the final provision of public goods and services, leading bureaucrats to make inefficient use of public resources. Small changes to these private incentives, then, could lead to large changes in the final provision of public goods and services and therefore to the welfare of society.

This seems to also be true in my setting. However, instead of changing incentives, it seems that small changes to the information set available to bureaucrats can induce much larger changes in the final provision of public goods and services, feeding back onto bureaucrat performance.[65] Bureaucrats face uncertainty, and the policy-relevant evidence to which they have been exposed can matter for their decisions in implementing these policies. However, because public servants often face weaker incentives than private sector employees, such as fixed wages and promotions by seniority, they may face weaker incentives to align their decisions with the objectives of principals, and may not choose to pay the private costs of acquiring relevant information. A social planner may do better in this case by providing targeted information and training to bureaucrats.

8 Conclusion

This research offers evidence that the exposure of bureaucrats to different types of economic ideas alters the types of policies they choose to implement. I find that bureaucrats who studied with Malthus delivered less relief in response to drought than those who studied with Jones, a contemporary critic of Malthus, supporting historical arguments that Malthusian population theory and its associated ideas diminished the responsiveness of the British colonial state to agrarian distress. From a modern policy perspective, the evidence suggests that training delivered to bureaucrats can align policy implementation with the design intended by principals. The results indicate that exposing bureaucrats to policy-relevant ideas from economics and related scientific fields would materially alter the delivery of modern public goods and services, especially if targeted to senior bureaucrats and political appointees.

However, the direction and magnitude of the influence of ideas on policy may not be obvious. To further inform policy, ideally researchers would determine which types of ideas can encourage which types of modern policies, and by how much. Another important question involves understanding how spreading these ideas to principals affects policy, rather than spreading ideas to bureaucrats. More research is needed to examine these questions.

[65] This is consistent with the presence of information frictions, as implied by Hjort et al. (2021).

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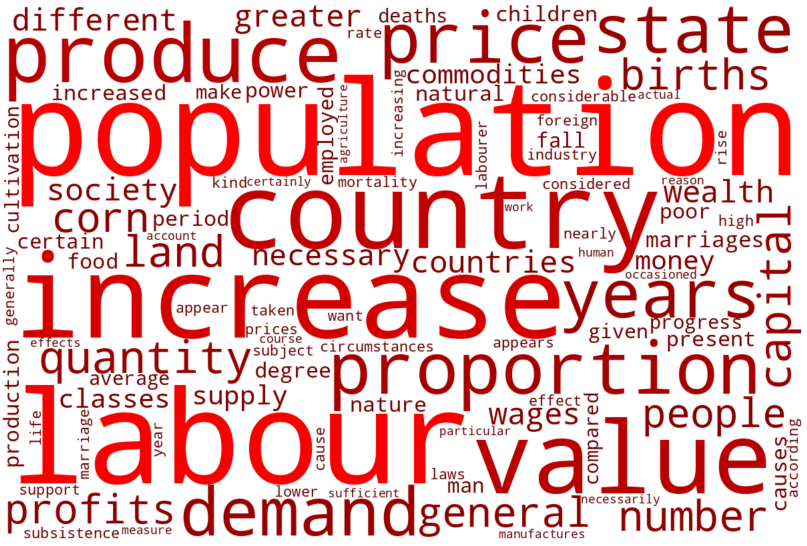
Figures



(a) Malthus, top 100 words

(b) Jones, top 100 words

Figure 1: Word-clouds, Malthus and Jones

Notes: Word clouds display the top 100 words by frequency from two works for each of Malthus (1826, 1836) and Jones (1831, 1859), after removing common English-language stopwords (articles, prepositions, etc.). Font size is proportional to the frequency of the usage of each word in the text, so that words used most frequently by each author appear largest in the word cloud.

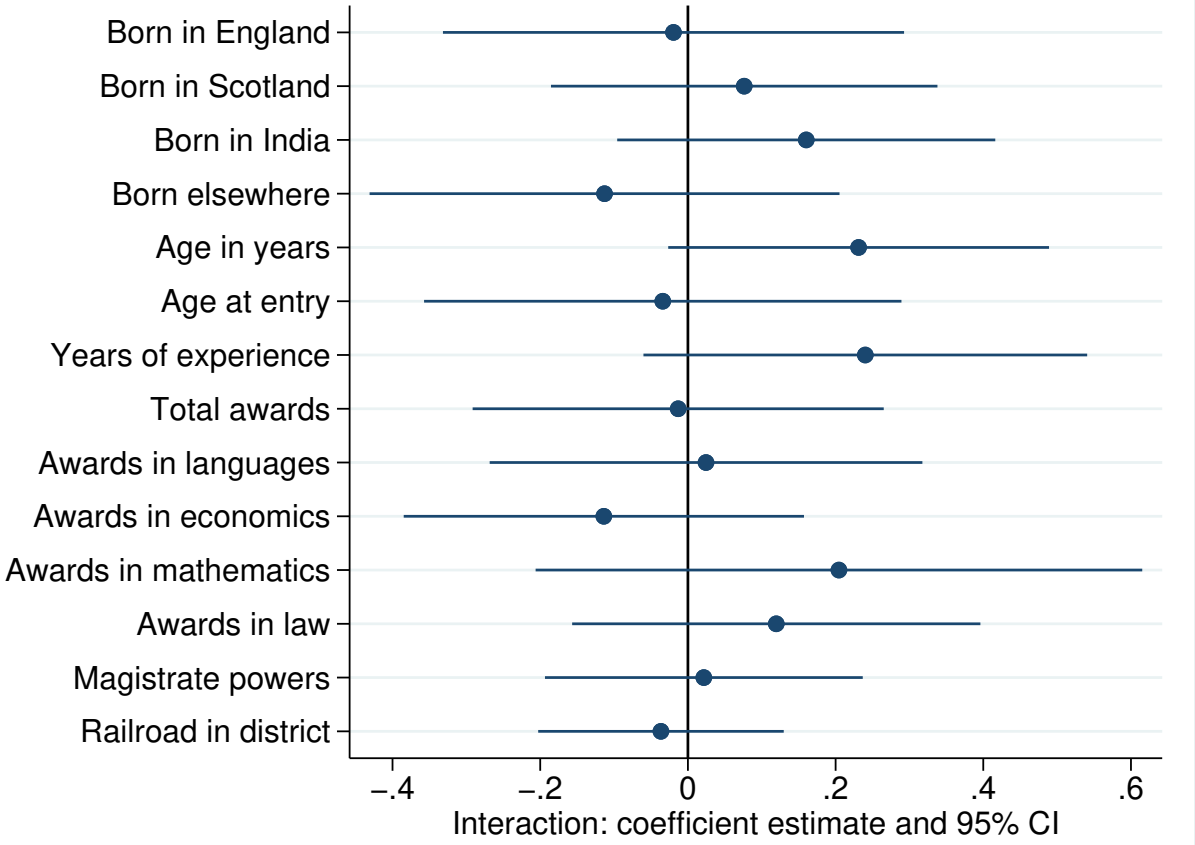


Figure 2: Balance tests: standardized interaction coefficient estimates

Notes: Each row plots the interaction coefficient estimate, δ_2 from Equation 2, and its 95% confidence interval from a regression of each standardized collector or district characteristic on drought, along with an indicator of whether the collector studied with Malthus at Haileybury, and the interaction of these two variables in the full panel; N=2,296. All specifications include district and year fixed effects. The outcomes are standardized by subtracting the mean and dividing by the standard deviation of the outcome in the full panel. Awards refers to the number of awards won by the collector in their coursework at Haileybury. Magistrate powers is a binary indicator for whether the collector was also entrusted with control of the police, jails, and criminal courts in the district-year. Data on railroads are from Donaldson (2018) and indicate whether the district was connected to the railroad network in the respective year. Standard errors are clustered by district.

Tables

Table 1: Relative text similarity of collector reports and economist writings, TF-IDF unigrams

	TF-IDF similarity to:		Difference:
	M $\times$ 100	J $\times$ 100	(M-J) $\times$ 100
	(1)	(2)	(3)
Panel A: Report-level metrics			
Malthusian	1.464	0.868	0.595
	(0.856)	(0.794)	(0.404)
Observations	291	291	291
Outcome mean	29.84	22.24	7.60
Outcome SD	3.66	2.93	2.41
	(4)	(5)	(6)
Panel B: Sentence-level metrics			
Malthusian	0.298**	0.158	0.140*
	(0.108)	(0.0990)	(0.0730)
Observations	52972	52972	52972
Outcome mean	5.63	4.13	1.50
Outcome SD	4.75	3.32	3.12
District FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Notes: * p $<$ 0.1, ** p $<$ 0.05, *** p $<$ 0.01. Table reports coefficient estimates from a regression of a measure of text similarity of collector reports with each author on an indicator of whether the collector studied with Malthus at Haileybury. TF-IDF similarity of the language between collector reports and economist writings is calculated for all unigrams (individual words, not phrases) from the writings of Malthus (1826, 1836), Jones (1831, 1859), and Ricardo (1817). This method assigns to each word a score based on its frequency in the author's text corpus, relative to its frequency across the corpus of author texts. The similarity of collector reports or sentences are measured as the cosine similarity between the vectors of these word-level scores for the report and author's text. These similarity measures range from 0 to 1, with higher scores indicating higher similarity; I rescale these measures to range from 0 to 100 to mimic percentage points. The table reports coefficients at report-level in Panel A and sentence-level in Panel B. Standard errors are clustered by author, reported in parentheses. All models include district and year fixed effects; the coefficient estimates for these variables are not reported in the table. Observations at report-level in panel A are less than in the full sample (N=2,296) because reports are only available for a selection of years in Madras. Standard errors are clustered by district, reported in parentheses.

Table 2: Summary statistics

	Mean	SD	Min	Max	N
Malthusian collector	0.28	0.45	0.00	1.00	2,296
Rainfall (inches) in district-year	50.93	29.23	8.37	261.06	2,296
Negative rainfall shock (SD)	0.39	0.53	0.00	4.34	2,296
Drought: rainfall $\geq$ 1 SD below district mean	0.15	0.36	0.00	1.00	2,296
Malthusian $\times$ drought	0.05	0.22	0.00	1.00	2,296
Collector years in civil service	22.66	5.25	6	47	2,296
Famine incidence (Gazzetteer)	0.08	0.28	0.00	1.00	2,296
Famine intensity (Gazzetteer)	0.05	0.17	0.00	0.88	2,296
Famine incidence (Srivastava)	0.20	0.40	0.00	1.00	1,609
Famine intensity (Srivastava)	0.09	0.21	0.00	1.00	1,609
Tax credits (write-offs) in district-year	45,051	127,311	0	1,426,846	2,296
Tax collections in district-year	1,331,642	717,511	3,131	4,331,848	2,296

Notes: Table reports summary statistics for the main variables used in the analysis, including means, standard deviations, minimum and maximum values, and the number of observations without missing data. Malthusian collector refers to whether the district-year was assigned a collector who entered the civil service before Malthus died in 1834. Rainfall is measured as the average annual rainfall in inches across all stations within the district borders, with any missing station-month observations spatially interpolated from nearby stations. Negative rainfall shocks are the number of standard-deviations below average rainfall in the district-year, or zero if rainfall was above the district average. Drought is a binary indicator for whether the district experienced a drought in the year, defined as rainfall falling at least one standard deviation below the district's mean. Malthusian $\times$ drought is the interaction of Malthusian with drought. Collector years in civil service are the number of years since the collector entered the civil service until the year observed in the panel. Famine incidence is an indicator of whether the year is mentioned in the district's textual accounts in the imperial Gazzetteer (Nathan et al., 1909); famine intensity is a probability-weighted average of intensity classifications ranging from 0 to 1, with probabilities classified by a neural network. Srivastava famines are defined analogously from the intersection of district boundaries with famine-affected regions, and intensities weighted by the share of the district's area lying under each color-coded intensity region from Srivastava (1968). Tax credits refers to the number of land tax collections written off, and tax collections refers to the total quantity of land taxes collected in the district-year; both are measured in current rupees.

Table 3: The effect of rainfall shortages on market prices and famine incidence

Panel A: Log prices and famine incidence, droughts				
	Log price, all grains	Log price, inferior grains	Famine, Gazzetteer	Famine, Srivastava
	(1)	(2)	(3)	(4)
Drought ($\geq$ 1 SD below mean)	0.0220*	0.0466***	0.0691***	0.115***
	(0.0116)	(0.0165)	(0.0150)	(0.0251)
Panel B: Log prices and famine incidence, rainfall shocks				
	(5)	(6)	(7)	(8)
Negative rainfall shock (SD)	0.0255***	0.0462***	0.0502***	0.0844***
	(0.00870)	(0.0125)	(0.0111)	(0.0196)
Observations	5034	2462	2296	1609
Outcome mean	2.04	1.63	0.08	0.20
Outcome SD	1.27	0.83	0.28	0.40
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Commodity FE	Yes	Yes	No	No
Controls	No	No	No	No

Notes: * p $<$ 0.1, ** p $<$ 0.05, *** p $<$ 0.01. Table reports coefficient estimates from a regression of the outcome variable on each measure of rainfall shortage: droughts in Panel A and negative rainfall shocks in Panel B. Negative rainfall shocks are the number of standard-deviations below average rainfall in the district-year, or zero if rainfall was above the district average. Drought is a binary indicator for whether the district experienced a drought in the year, defined as rainfall at least one standard deviation below the district's mean. The dependent variables in models (1), (2), (5), and (6) are the log prices of food-grains measured in current rupees per maund (equivalent to 82.28 pounds), and famine incidence is an indicator of whether the year is mentioned in the district's textual accounts in the imperial Gazzetteer (Nathan et al., 1909) in models (3) and (7), or an indicator of whether the district's boundary intersects with a given year's famine-affected region from the maps in Srivastava (1968) in models (4) and (8). Standard errors are clustered by commodity-district in models (1), (2), (5), and (6), and by district in columns (3), (4), (7), and (8), reported in parentheses.

Table 4: Relative differences in collector tax write-offs during rainfall shortages

Panel A: Land tax write-offs ('000 Rs.), droughts				
	Land tax write-offs ('000 Rs.)			
	(1)	(2)	(3)	(4)
δ_1: Drought ($\geq$ 1 SD below mean)	0.0767	0.105	-9.813*	-9.506*
	(0.0961)	(0.0950)	(5.459)	(5.613)
δ_2: Malthusian $\times$ drought	-0.322**	-0.325*	-14.82**	-13.74*
	(0.162)	(0.171)	(7.417)	(7.284)
$\delta_1 + \delta_2$: Avg. Malthusian response	-0.245**	-0.220*	-24.633***	-23.242***
	(0.119)	(0.134)	(8.521)	(8.163)
Panel B: Land tax write-offs ('000 Rs.), rainfall shocks				
	(5)	(6)	(7)	(8)
δ_1: Negative rainfall shock (SD)	0.110	0.134*	-5.135	-4.883
	(0.0698)	(0.0752)	(3.674)	(3.737)
δ_2: Malthusian $\times$ shock (SD)	-0.347***	-0.363**	-16.73*	-16.40*
	(0.133)	(0.155)	(8.943)	(9.092)
$\delta_1 + \delta_2$: Avg. Malthusian response	-0.237*	-0.229	-21.862**	-21.287**
	(0.125)	(0.147)	(10.459)	(10.732)
Observations	2281	2281	2296	2296
Specification	PPML	PPML	OLS	OLS
Outcome mean	45.35	45.35	45.05	45.05
Outcome SD	127.7	127.7	127.3	127.3
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes

Notes: * p $<$ 0.1, ** p $<$ 0.05, *** p $<$ 0.01. Table reports coefficient estimates from a regression of land tax writeoffs (in thousands of current rupees) on two measures of rainfall shortage: droughts in Panel A and negative rainfall shocks in Panel B, along with an indicator of whether the collector studied with Malthus at Haileybury, and the interaction of these two variables. Negative rainfall shocks are the number of standard-deviations below average rainfall in the district-year, or zero if rainfall was above the district average. Drought is a binary indicator for whether the district experienced a drought in the year, defined as rainfall at least one standard deviation below the district's mean. Models (1), (2), (5), and (6) report coefficients in log points, estimated by poisson pseudo-maximum likelihood. Models (3), (4), (7), and (8) report coefficients in thousands of rupees, estimated by OLS in levels. District and year fixed effects and Malthusian intercept are included in all specifications but their coefficient estimates are not reported in the table. Coefficients for controls are also omitted; controls include bureaucrat age, experience, number of awards in mathematics and economics, and the share of the district-year's rainfall station-month observations imputed. Observations are slightly lower than in the full sample (N=2,296) because separated observations are dropped prior to estimation by PPML. Standard errors are clustered by district, reported in parentheses.

Table 5: Relative differences in probability of government intervention during drought

	Government works	Gratuitous relief	Food imports	Government advances
	(1)	(2)	(3)	(4)
δ_1: Drought ($\geq$ 1 SD below mean)	2.914***	1.101	1.012**	3.072***
	(0.928)	(0.733)	(0.464)	(0.958)
δ_2: Malthusian $\times$ drought	-2.196**	-0.841	-0.640*	-1.762*
	(0.899)	(0.823)	(0.354)	(0.971)
$\delta_1 + \delta_2$: Avg. Malthusian coef.	0.718**	0.260	0.371	1.309**
	(0.323)	(0.309)	(0.268)	(0.560)
Observations	2296	2296	2296	2296
Outcome Mean	1.858	1.142	0.566	1.700
Outcome SD	9.317	9.361	5.627	9.536
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	No	No	No	No

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Table reports coefficient estimates from a regression of the probability of the implementation of each government intervention, imputed by a neural network from textual accounts in the Imperial Gazzetteer, on drought along with an indicator of whether the collector studied with Malthus at Haileybury, and the interaction of these two variables. Drought is a binary indicator for whether the district experienced a drought in the year, defined as rainfall at least one standard deviation below the district's mean. All models include district and year fixed effects and Malthusian intercept; the coefficient estimates for these variables are not reported in the table. Standard errors are clustered by district, reported in parentheses.

Table 6: Relative differences in log imperial expenditures on public works during drought, Madras

	Total imperial works		New works	Repairs
	(1)	(2)	(3)	(4)
δ_1: Drought ($\geq$ 1 SD below mean)	0.00781	0.0491	0.148	0.0946
	(0.0674)	(0.0684)	(0.137)	(0.0654)
δ_2: Malthusian $\times$ drought	-0.137	-0.236*	-0.374*	-0.273**
	(0.118)	(0.128)	(0.195)	(0.117)
$\delta_1 + \delta_2$: Avg. Malthusian response	-0.129	-0.186	-0.226	-0.179*
	(0.123)	(0.127)	(0.216)	(0.090)
Observations	308	291	291	291
Outcome mean	182.06	179.58	80.85	98.73
Outcome SD	126.53	127.08	87.04	71.17
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	No	No	No	No

Notes: * p $<$ 0.1, ** p $<$ 0.05, *** p $<$ 0.01. Table reports coefficient estimates from a regression of log imperial public works expenditures on drought, along with an indicator of whether the collector studied with Malthus at Haileybury, and the interaction of these two variables. Column (1) reports these estimates for total imperial expenditures from the full sample, and column (2) for total imperial expenditure from all years with data disaggregated into expenditures on new works versus repairs of existing works. Columns (3) and (4) report estimates from the same specification for expenditures on new public works and repairs of existing works, respectively. Drought is a binary indicator for whether the district experienced a drought in the year, defined as rainfall at least one standard deviation below the district's mean. All models include district and year fixed effects and Malthusian intercept; the coefficient estimates for these variables are not reported in the table. Observations are lower than in the full sample (N=2,296) because panel data by district-year is only available for Madras during this period. Standard errors are clustered by district, reported in parentheses.

Table 7: Relative differences in collector performance

Panel A: Collector performance, droughts		
	(1)	(2)
δ_1: Drought ($\geq$ 1 SD below mean)	0.0629	0.0554
	(0.0583)	(0.0597)
δ_2: Malthusian $\times$ drought	-0.132	-0.0814
	(0.0971)	(0.0939)
Panel B: Collector performance, rainfall shocks		
	(3)	(4)
δ_1: Negative rainfall shock (SD)	0.0406	0.0299
	(0.0355)	(0.0344)
δ_2: Malthusian $\times$ shock (SD)	-0.135**	-0.0781
	(0.0573)	(0.0565)
Observations	1010	1010
Outcome mean	0.23	0.23
Outcome SD	0.42	0.42
District FE	Yes	Yes
Year FE	Yes	Yes
Controls	No	Yes

Notes: * p $<$ 0.1, ** p $<$ 0.05, *** p $<$ 0.01. Table reports coefficient estimates from OLS regression of a binary indicator of whether the collector was named for good performance by their superiors on two measures of rainfall shortage: droughts in Panel A and negative rainfall shocks in Panel B, along with an indicator of whether the collector studied with Malthus at Haileybury, and the interaction of these two variables. Negative rainfall shocks are the number of standard-deviations below average rainfall in the district-year, or zero if rainfall was above the district average. Drought is a binary indicator for whether the district experienced a drought in the year, defined as rainfall at least one standard deviation below the district's mean. All models include district and year fixed effects and Malthusian intercept; the coefficient estimates for these variables are not reported in the table. Observations are lower than in the full sample (N=2,296) because performance records are only available for Bengal and a selection of years in the Northwest Provinces, and never available for Madras or Bombay. Standard errors are clustered by district, reported in parentheses.

Table 8: Relative differences in collector tax write-offs during drought, heterogeneity by collector academic awards

Awards variable:	Total	Languages	Economics	Mathematics
	(1)	(2)	(3)	(4)
Drought ($\geq$ 1 SD below mean)	0.158	0.184	0.0955	0.125
	(0.113)	(0.122)	(0.0981)	(0.108)
Malthusian $\times$ drought	-0.464**	-0.450**	-0.467**	-0.371*
	(0.219)	(0.208)	(0.185)	(0.189)
Malthusian $\times$ drought $\times$ awards	0.0878	0.191	0.867**	0.538**
	(0.0771)	(0.163)	(0.416)	(0.229)
Average differential response, at 5th percentile awards	-0.464**	-0.450**	-0.467**	-0.371*
	(0.219)	(0.208)	(0.185)	(0.189)
Average differential response, at 95th percentile awards	0.238	0.313	0.401	0.167
	(0.498)	(0.536)	(0.357)	(0.204)
Observations	2281	2281	2281	2281
Specification	PPML	PPML	PPML	PPML
Outcome mean	45.35	45.35	45.35	45.35
Outcome SD	127.68	127.68	127.68	127.68
5th percentile awards	0	0	0	0
95th percentile awards	8	4	1	1
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	No	No	No	No

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Table reports coefficient estimates from a regression of land tax writeoffs (in thousands of current rupees) on a triple interaction with drought, Malthusian, and each of four collector awards variables. Column (1) interacts with the total number of awards earned by the civil servant during their studies at Haileybury, column (2) with all awards earned in language course such as Hindi or Persian, column (3) with awards in political economy, and column (4) for awards in mathematics courses. Missing data on collector awards are imputed by replacing with the mean. Drought is a binary indicator for whether the district experienced a drought in the year, defined as rainfall at least one standard deviation below the district's mean. All models report coefficients in log points, estimated by poisson pseudo-maximum likelihood. All models include district and year fixed effects, Malthusian intercept, each respective awards variable, and interactions (interaction $\times$ drought, & interaction $\times$ Malthusian) are included in each specification but their coefficient estimates are not reported in the table. Average differential responses is a linear combination of coefficients from the interaction terms, calculated as the predicted difference in tax write-offs between Malthusians and Jonesians during drought, evaluated at either the fifth or ninety-fifth percentile of each awards variable. Observations are slightly lower than in the full sample (N=2,296) because separated observations are dropped prior to estimation by PPML. Standard errors are clustered by district, reported in parentheses.

Table 9: Relative differences in collector tax write-offs during drought, heterogeneity by collector authority and discretion

Interaction variable:	Landlord district	Magistrate powers	Years of experience	District area, '00 square km
	(1)	(2)	(3)	(4)
Drought ($\geq$ 1 SD below mean)	0.0732	0.261**	-0.975	0.277
	(0.0946)	(0.113)	(0.784)	(0.208)
Malthusian $\times$ drought	-0.366**	-0.181	1.897	-0.0821
	(0.181)	(0.206)	(1.998)	(0.294)
Malthusian $\times$ drought $\times$ interaction var	0.333	-0.133	-0.0850	-0.00159
	(0.357)	(0.272)	(0.0755)	(0.00175)
Average differential response, at 5th percentile interaction var	-0.366**	-0.181	0.793	-0.138
	(0.181)	(0.206)	(1.021)	(0.244)
Average differential response, at 95th percentile interaction var	-0.033	-0.315*	-0.652**	-0.428**
	(0.352)	(0.174)	(0.310)	(0.214)
Observations	2281	2281	2281	2281
Specification	PPML	PPML	PPML	PPML
Outcome mean	45.35	45.35	45.35	45.35
Outcome SD	127.68	127.68	127.68	127.68
5th percentile interaction var	0	0	13	35.42
95th percentile interaction var	1	1	30	218.07
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	No	No	No	No

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Table reports coefficient estimates from a regression of land tax writeoffs (in thousands of current rupees) on a triple interaction with drought, Malthusian, and each of four district or collector characteristics. Column (1) interacts with a binary indicator of whether the district's land tax collections are contracted out to local landlords (zamindars), column (2) with an indicator of whether the collector in the district-year also oversaw the policy, jails, and criminal courts, column (3) with the number of years of experience of the collector, and column (4) with the size of the district's area, in hundreds of square kilometers. Drought is a binary indicator for whether the district experienced a drought in the year, defined as rainfall at least one standard deviation below the district's mean. All models report coefficients in log points, estimated by poisson pseudo-maximum likelihood. All models include district and year fixed effects, Malthusian intercept, each respective interaction variable, and interactions (interaction $\times$ drought & interaction $\times$ Malthusian) are included in each specification but their coefficient estimates are not reported in the table. Average differential responses is a linear combination of coefficients from the interaction terms, calculated as the predicted difference in tax write-offs between Malthusians and Jonesians during drought, evaluated at either the fifth or ninety-fifth percentile of each of the four respective interaction variables. Observations are slightly lower than in the full sample (N=2,296) because separated observations are dropped prior to estimation by PPML. Standard errors are clustered by district, reported in parentheses.

A Appendix

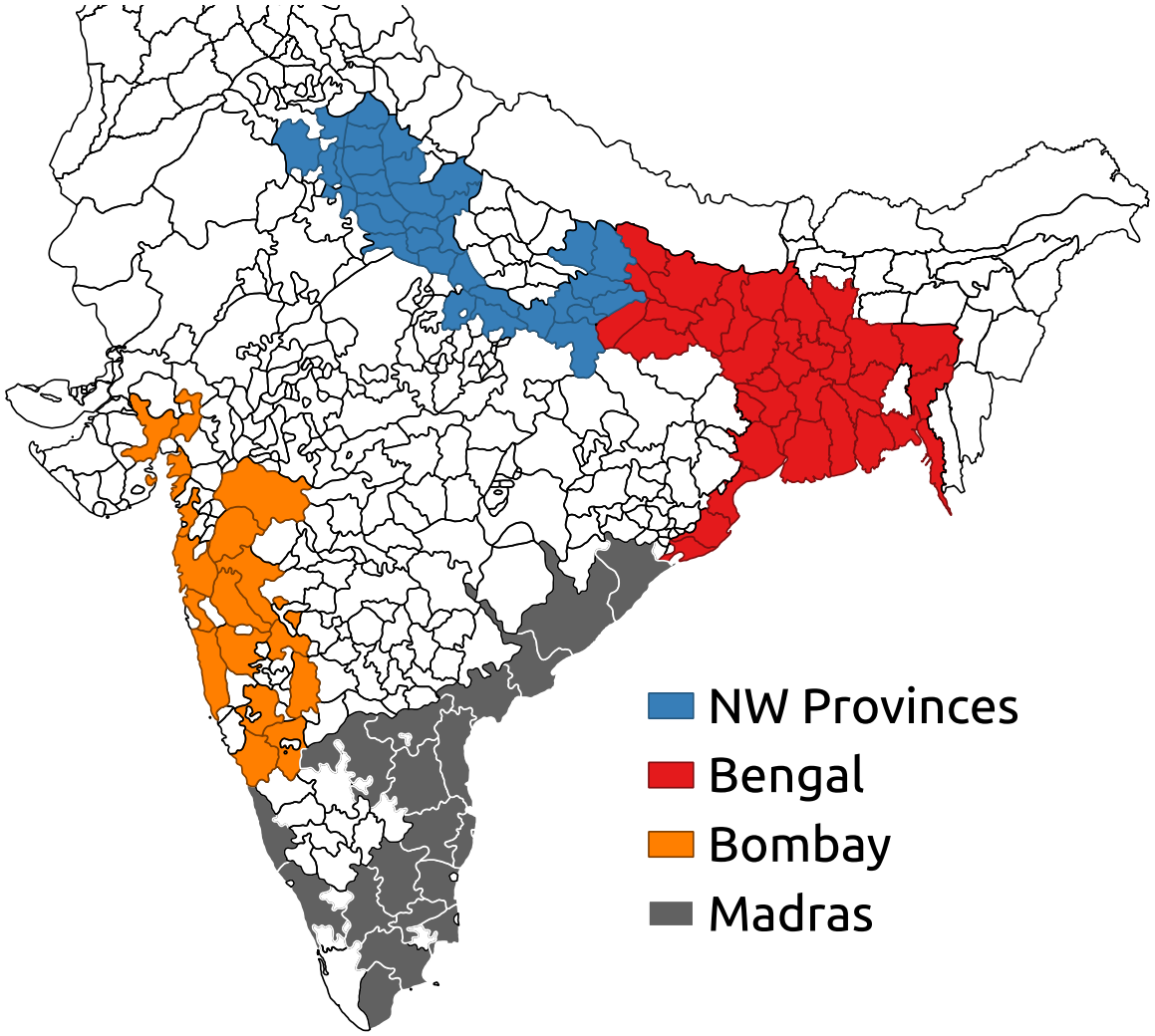


Figure A1: Districts and provinces under civil service administration

Notes: Figure illustrates the boundaries of the districts and provinces of much of the territory of south Asia under either British rule or administered by various semi-independent princely states as of the mid-1870's. Regions administered by the civil service of the British colonial government are shaded in blue (Northwest Provinces), red (Bengal), orange (Bombay), and grey (Madras). Other regions (white) were non-regulation provinces administered primarily by the British military or by princely states.

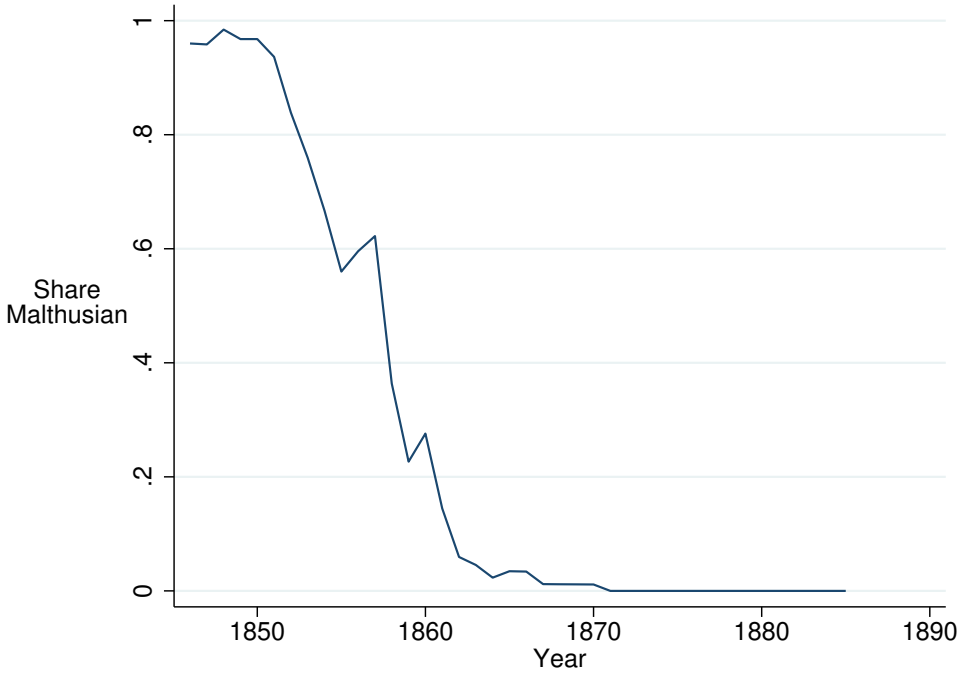
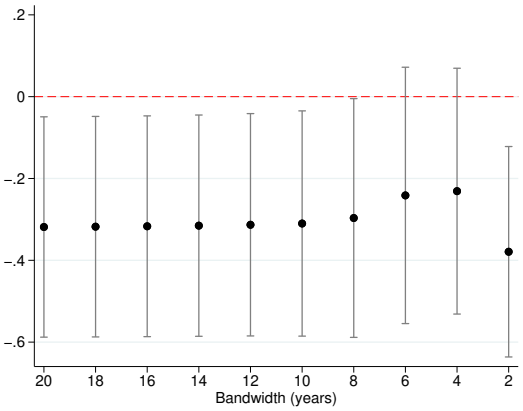


Figure A2: Share of Malthusian collectors by year, 1846 to 1885

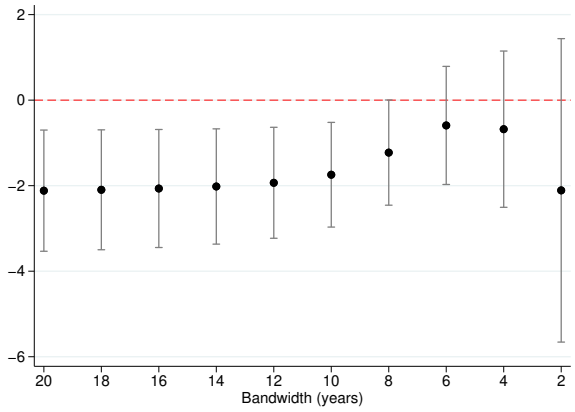
Notes: Figure plots the share of collectors in the panel who entered the civil service before Malthus died in 1834 (Malthusian) on the y-axis, by year that they are observed serving as a collector in the panel of districts on the x-axis. Data for Bengal begins in 1846, for the Northwest Provinces in 1848, for Madras in 1853, and for Bombay in 1860.

Figure A3: Collector year of entry, box-plots by year of panel

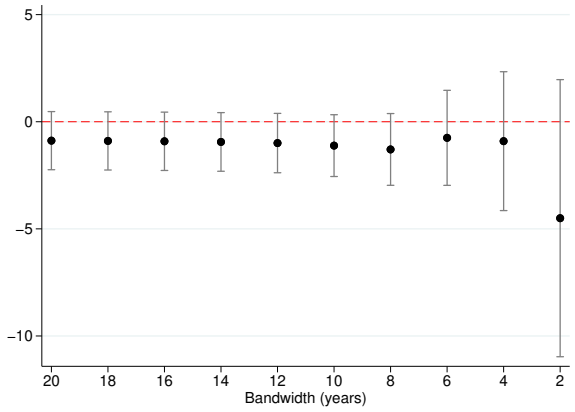
Notes: Figure plots the distribution of collectors year of entry into the civil service in box-plots on the y-axis, against the year they are observed in the district panel on the x-axis. The red horizontal line indicates the threshold below which all collectors would have entered the civil service while Malthus was still alive, and those above this line would have entered after Malthus died. The last Malthusian collector is observed in 1870, and the last Jonesian collector is observed in 1885. The box-plots show the interquartile range of the year of entry for each group, with the median year of entry denoted by the horizontal line within each box. The whiskers extend to the minimum and maximum years of entry for each group, excluding outliers. The data are restricted to collectors who entered the civil service before 1855, by which point Jones had died, so that the last year of observation in the panel is 1885.



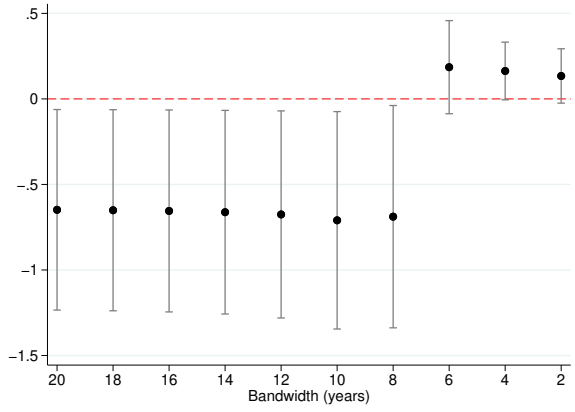
(a) Tax write-offs



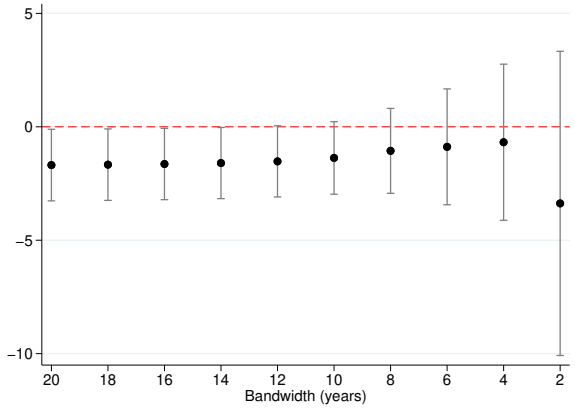
(b) Government works probability



(c) Gratuitous relief probability



(d) Food imports probability



(e) Government advances probability

Figure A4: Interaction term estimates, epanechnikov kernel weights

Notes: Figure plots coefficient estimates and 90% confidence intervals for the interaction term (Malthusian × drought) from epanechnikov kernel-weighted specifications, based on the year of entry to the civil service, centered on cohorts who entered just before or after the death of Malthus. Bandwidths (on x-axis) range from twenty years before or after his death, down to two years before or after. Exhibit (a) reports coefficients in log points for the tax write-offs outcome, estimated by PPML, and exhibits (b) through (e) report coefficients in percentage points for each intervention probability, estimated by OLS. All models include district and year fixed effects, drought, and Malthusian intercept.

Table A1: Balance of district and collector characteristics

Variable	Interaction coef. (SE)	Mean (SD)	Observations
Born in England	-0.009	0.303	2,296
	(0.072)	(0.460)	
Born in Scotland	0.019	0.069	2,296
	(0.034)	(0.254)	
Born in India	0.046	0.090	2,296
	(0.037)	(0.286)	
Born elsewhere	-0.056	0.537	2,296
	(0.080)	(0.499)	
Age in years	1.221*	39.762	2,296
	(0.687)	(5.281)	
Age at entry	-0.041	18.106	2,296
	(0.198)	(1.213)	
Years of experience	1.262	21.656	2,296
	(0.796)	(5.254)	
Total awards	-0.042	1.669	2,296
	(0.444)	(3.159)	
Awards in languages	0.031	0.535	2,296
	(0.185)	(1.253)	
Awards in economics	-0.055	0.141	2,296
	(0.065)	(0.479)	
Awards in mathematics	0.121	0.152	2,296
	(0.122)	(0.589)	
Awards in law	0.074	0.188	2,296
	(0.086)	(0.617)	
Magistrate powers	0.009	0.771	2,296
	(0.046)	(0.420)	
Railroad in district	-0.017	0.345	2,296
	(0.040)	(0.475)	

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Table presents the mean and standard deviation of each balance variable, along with the interaction coefficient estimate and standard error from a regression of each collector or district characteristic on drought, along with an indicator of whether the collector studied with Malthus at Haileybury, and their interaction in the full panel. All specifications include district and year fixed effects. Awards refers to the number of awards won by the collector in their coursework at Haileybury. Magistrate powers is a binary indicator for whether the collector was also entrusted with control of the police, jails, and criminal courts in the district-year. Data on railroads are from Donaldson (2018) and indicate whether the district was connected to the railroad network in the respective year. Standard errors are clustered by district.

Table A2: Relative differences in public works expenditures and intervention probabilities during drought, with controls

	Imperial works	Govt. works	Gratuitous relief	Food imports	Govt. advances
	(1)	(2)	(3)	(4)	(5)
δ_1: Drought ($\geq$ 1 SD below mean)	-0.0116	2.922***	1.063	1.045**	3.046***
	(0.0742)	(0.943)	(0.733)	(0.488)	(0.970)
δ_2: Malthusian $\times$ drought	-0.239**	-2.282**	-0.718	-0.683*	-1.794*
	(0.110)	(0.919)	(0.813)	(0.375)	(0.980)
$\delta_1 + \delta_2$: Avg. Malthusian coef.	-0.251**	0.641**	0.345	0.361	1.252**
	(0.107)	(0.318)	(0.326)	(0.263)	(0.553)
Observations	308	2296	2296	2296	2296
Outcome Mean	182.06	1.858	1.142	0.566	1.700
Outcome SD	126.53	9.317	9.361	5.627	9.536
District FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. Table reports coefficient estimates from a regression of log imperial public works expenditures (in column 1) or the probability of the implementation of each government intervention (in columns 2-5), imputed by a neural network from textual accounts in the Imperial Gazzetteer (Nathan et al., 1909), on drought along with an indicator of whether the collector studied with Malthus at Haileybury, and the interaction of these two variables. Drought is a binary indicator for whether the district experienced a drought in the year, defined as rainfall at least one standard deviation below the district's mean. All models include district and year fixed effects, as well as Malthusian intercept and controls; coefficient estimates for these variables are not reported in the table. controls include bureaucrat age, experience, number of awards in mathematics and economics, and the share of the district-year's rainfall station-month observations imputed. Observations are lower than in the full sample for public works expenditure (N=2,296) because panel data by district-year is only available for a selection of years in Madras during this period. Standard errors are clustered by district, reported in parentheses.

Table A3: Relative differences in public works expenditures and intervention probabilities during negative rainfall shocks

	Imperial works	Govt. works	Gratuitous relief	Food imports	Govt. advances
	(1)	(2)	(3)	(4)	(5)
δ_1: Negative rainfall shock (SD)	0.119	1.669***	1.068**	0.579**	1.948***
	(0.0989)	(0.537)	(0.498)	(0.249)	(0.615)
δ_2: Malthusian $\times$ shock (SD)	-0.0223	-1.414**	-1.048*	-0.503**	-1.530**
	(0.131)	(0.570)	(0.531)	(0.220)	(0.696)
$\delta_1 + \delta_2$: Avg. Malthusian coef.	0.097	0.255	0.020	0.076	0.417
	(0.152)	(0.241)	(0.185)	(0.092)	(0.434)
Observations	308	2296	2296	2296	2296
Outcome Mean	182.06	1.858	1.142	0.566	1.700
Outcome SD	126.53	9.317	9.361	5.627	9.536
District FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Controls	No	No	No	No	No

Notes: * p $<$ 0.1, ** p $<$ 0.05, *** p $<$ 0.01. Table reports coefficient estimates from a regression of log imperial public works expenditures (in column 1) or the probability of the implementation of each government intervention (in columns 2 through 5), imputed by a neural network from textual accounts in the Imperial Gazzetteer (Nathan et al., 1909), on negative rainfall shocks and an an indicator of whether the collector studied with Malthus at Haileybury, as well as the interaction of these two variables. Negative rainfall shocks are the number of standard-deviations below average rainfall in the district-year, or zero if rainfall was above the district average. Drought is a binary indicator for whether the district experienced a drought in the year, defined as rainfall at least one standard deviation below the district's mean. All models include district and year fixed effects, as well as Malthusian intercept and controls; coefficient estimates for these variables are not reported in the table. controls include bureaucrat age, experience, number of awards in mathematics and economics, and the share of the district-year's rainfall station-month observations imputed. Observations are lower than in the full sample for public works expenditure (N=2,296) because panel data by district-year is only available for a selection of years in Madras during this period. Standard errors are clustered by district, reported in parentheses.

Table A4: Relative differences in collector performance, bins of negative rainfall shocks

	(1)	(2)
Rainfall shock: 0.01-0.5 SD	0.0197	0.00157
	(0.0481)	(0.0469)
Rainfall shock: 0.5-1.0 SD	0.0279	0.00884
	(0.0421)	(0.0455)
Rainfall shock: 1.0-1.5 SD	0.0330	0.0271
	(0.0656)	(0.0677)
Rainfall shock: 1.5+ SD	0.145	0.118
	(0.0986)	(0.0925)
Malthusian $\times$ shock (0.01-0.5 SD)	-0.0932	-0.0434
	(0.0834)	(0.0836)
Malthusian $\times$ shock (0.5-1.0 SD)	-0.123	-0.0621
	(0.0816)	(0.0887)
Malthusian $\times$ shock (1.0-1.5 SD)	-0.0851	-0.0512
	(0.112)	(0.112)
Malthusian $\times$ shock (1.5+ SD)	-0.361***	-0.222*
	(0.125)	(0.120)
Observations	1010	1010
Outcome mean	0.23	0.23
Outcome SD	0.42	0.42
District FE	Yes	Yes
Year FE	Yes	Yes
Controls	No	Yes

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Table reports coefficient estimates from OLS regression of a binary indicator of whether the collector was named for good performance by their superiors on binary measures of rainfall shortage intensity, indicating whether the standardized shortage fell in each range below the district's mean, and the interaction of each of these bins with the training regime of the collector. All models include district and year fixed effects, as well as Malthusian intercept and controls; coefficient estimates for these variables are not reported in the table. Controls include bureaucrat age, experience, number of awards in mathematics and economics, and the share of the district-year's rainfall station-month observations imputed. Observations are lower than in the full sample (N=2,296) because performance records are only available for Bengal and a selection of years in the Northwest Provinces, and never available for Madras or Bombay. Standard errors are clustered by district, reported in parentheses.

Table A5: Relative differences in tax write-offs and intervention, extra controls

	Tax write-offs	Govt. works	Gratuitous relief	Food imports	Govt. advances
	(1)	(2)	(3)	(4)	(5)
δ_1: Drought ($\geq$ 1 SD below mean)	0.0958	2.874***	1.084	1.010**	3.044***
	(0.0949)	(0.944)	(0.745)	(0.482)	(0.971)
δ_2: Malthusian $\times$ drought	-0.281*	-2.282**	-0.648	-0.657*	-1.732*
	(0.144)	(0.908)	(0.783)	(0.365)	(0.948)
Observations	2281	2296	2296	2296	2296
Outcome Mean	45.348	1.858	1.142	0.566	1.700
Outcome SD	128	9.317	9.361	5.627	9.536
Specification	PPML	OLS	OLS	OLS	OLS
District FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes

Notes: * p $<$ 0.1, ** p $<$ 0.05, *** p $<$ 0.01. Table reports coefficient estimates from a regression of land tax writeoffs (column 1, in thousands of current rupees) and intervention probabilities (columns 2 through 5, in percentage points) on drought, along with an indicator of whether the collector studied with Malthus at Haileybury, and the interaction of these two variables. Intervention probabilities are imputed by a neural network from textual accounts in the Imperial Gazzetteer (Nathan et al., 1909). Drought is a binary indicator for whether the district experienced a drought in the year, defined as rainfall at least one standard deviation below the district's mean. Model (1) reports coefficients in log points, estimated by poisson pseudo-maximum likelihood. Models (2) through (5) report coefficients in percentage points, estimated by OLS. District and year fixed effects, Malthusian intercept, and controls are included in all specifications but their coefficient estimates are not reported in the table. Controls include observed district and collector characteristics: place of birth of collector, age, years of experience, total number of awards won at Haileybury and separately the number of awards won in languages, law, mathematics, and economics, indicators for magistrate powers of the collector and presence of a railroad in the district, and the share of the district-year's rainfall station-month observations imputed, rather than observed directly. Observations in column (1) are slightly lower than in the full sample (N=2,296) because separated observations are dropped prior to estimation by PPML. Standard errors are clustered by district, reported in parentheses.

Table A6: Relative differences in tax write-offs and intervention, before and after Crown rule

Panel A: Company rule (before 1858)	Tax write-offs	Govt. works	Gratuitous relief	Food imports	Govt. advances
	(1)	(2)	(3)	(4)	(5)
δ_1: Drought ($\geq$ 1 SD below mean)	-0.834	0.00628	.	0.000314	0.00220
	(0.766)	(0.00657)	(.)	(0.000329)	(0.00230)
δ_2: Malthusian $\times$ drought	0.835	0.0155	.	0.000775	0.00542
	(0.778)	(0.0155)	(.)	(0.000777)	(0.00544)
Observations	666	686	686	686	686
Outcome Mean	44.760	0.003	0.000	0.000	0.001
Outcome SD	150	0.076	0.000	0.004	0.027
Panel B: Crown rule (1858 onwards)					
	(6)	(7)	(8)	(9)	(10)
δ_1: Drought ($\geq$ 1 SD below mean)	0.0709	3.236***	1.182	1.115**	3.388***
	(0.0798)	(1.028)	(0.771)	(0.503)	(1.040)
δ_2: Malthusian $\times$ drought	-0.207	-0.865	0.742	-0.547	3.266
	(0.182)	(1.757)	(1.467)	(0.618)	(3.160)
Observations	1585	1609	1609	1609	1609
Outcome Mean	46.453	2.650	1.630	0.808	2.425
Outcome SD	118	11.036	11.147	6.708	11.314
Specification	PPML	OLS	OLS	OLS	OLS
District FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Controls	No	No	No	No	No

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Table reports coefficient estimates from a regression of land tax writeoffs (column 1, in thousands of current rupees) and intervention probabilities (columns 2 through 5, in percentage points) on drought, along with an indicator of whether the collector studied with Malthus at Haileybury, and the interaction of these two variables. Intervention probabilities are imputed by a neural network from textual accounts in the Imperial Gazzetteer (Nathan et al., 1909). Panel A reports coefficient estimates for the subset of years before the formal transfer of administration to the British crown in 1858, and Panel B reports coefficient estimates for the subset of years after this transfer. Drought is a binary indicator for whether the district experienced a drought in the year, defined as rainfall at least one standard deviation below the district's mean. Model (1) reports coefficients in log points, estimated by poisson pseudo-maximum likelihood. Models (2) through (5) report coefficients in percentage points, estimated by OLS. District and year fixed effects and Malthusian intercept are included in all specifications but their coefficient estimates are not reported in the table. Observations in column (1) are slightly lower than in the full sample (N=2,296) because separated observations are dropped prior to estimation by PPML. Standard errors are clustered by district, reported in parentheses.

Table A7: Relative differences in tax write-offs and intervention, after Charter Act 1853

	Tax write-offs	Govt. works	Gratuitous relief	Food imports	Govt. advances
Panel A: After Charter Act (1853 onwards), drought					
	(1)	(2)	(3)	(4)	(5)
δ_1: Drought ($\geq$ 1 SD below mean)	0.0795	3.055***	1.132	1.084**	3.206***
	(0.0961)	(0.950)	(0.749)	(0.489)	(0.977)
δ_2: Malthusian $\times$ drought	-0.332**	-1.887**	-0.358	-0.686	-0.953
	(0.166)	(0.933)	(0.897)	(0.436)	(1.353)
Panel B: After Charter Act (1853 onwards), negative rainfall shocks					
	(6)	(7)	(8)	(9)	(10)
δ_1: Negative rainfall shock (SD)	0.111	1.767***	1.110**	0.621**	2.032***
	(0.0699)	(0.548)	(0.511)	(0.261)	(0.626)
δ_2: Malthusian $\times$ shock	-0.343**	-1.276*	-0.926	-0.495*	-1.290
	(0.136)	(0.664)	(0.560)	(0.275)	(1.017)
Observations	1921	1934	1934	1934	1934
Specification	PPML	OLS	OLS	OLS	OLS
Outcome Mean	53.081	2.204	1.356	0.672	2.017
Outcome SD	138	10.114	10.185	6.126	10.359
District FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Controls	No	No	No	No	No

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Table reports coefficient estimates from a regression of land tax writeoffs (column 1, in thousands of current rupees) and intervention probabilities (columns 2 through 5, in percentage points) on drought, along with an indicator of whether the collector studied with Malthus at Haileybury, and the interaction of these two variables. Intervention probabilities are imputed by a neural network from textual accounts in the Imperial Gazzetteer (Nathan et al., 1909). Panel A reports coefficient estimates for the subset of years before the informal transfer of administration to the British crown after 1853, and Panel B reports coefficient estimates for the subset of years after the 1853 Charter Act. Drought is a binary indicator for whether the district experienced a drought in the year, defined as rainfall at least one standard deviation below the district's mean. Models (1), reports coefficients in log points, estimated by poisson pseudo-maximum likelihood. Models (2) through (5) report coefficients in percentage points, estimated by OLS. District and year fixed effects and Malthusian intercept are included in all specifications but their coefficient estimates are not reported in the table. Observations in column (1) are slightly lower than in the full sample (N=2,296) because separated observations are dropped prior to estimation by PPML. Standard errors are clustered by district, reported in parentheses.

Table A8: Relative differences in tax write-offs and intervention, years with both groups active

	Tax write-offs	Govt. works	Gratuitous relief	Food imports	Govt. advances
Panel A: Overlapping collector types (1846-1870), drought					
	(1)	(2)	(3)	(4)	(5)
δ_1: Drought ($\geq$ 1 SD below mean)	-0.0451	2.221**	1.598*	1.463**	2.162**
	(0.155)	(0.888)	(0.907)	(0.682)	(0.926)
δ_2: Malthusian $\times$ drought	-0.188	-1.382	-1.559	-0.916*	-0.853
	(0.217)	(0.876)	(1.019)	(0.539)	(0.977)
Panel B: Overlapping collector types (1846-1870), negative rainfall shocks					
	(6)	(7)	(8)	(9)	(10)
δ_1: Negative rainfall shock (SD)	0.0306	1.452***	1.529***	0.872**	1.713**
	(0.122)	(0.480)	(0.579)	(0.373)	(0.702)
δ_2: Malthusian $\times$ shock	-0.276*	-1.243**	-1.505**	-0.726**	-1.255*
	(0.163)	(0.528)	(0.595)	(0.330)	(0.748)
Observations	1705	1718	1718	1718	1718
Outcome Mean	45.040	1.439	0.745	0.578	1.389
Outcome SD	126	8.203	7.758	5.959	8.944
Specification	PPML	OLS	OLS	OLS	OLS
District FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Controls	No	No	No	No	No

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Table reports coefficient estimates from a regression of land tax writeoffs (column 1, in thousands of current rupees) and intervention probabilities (columns 2 through 5, in percentage points) on two measures of rainfall shortage: droughts in Panel A and negative rainfall shocks in Panel B, along with an indicator of whether the collector studied with Malthus at Haileybury, and the interaction of both variables. Intervention probabilities are imputed by a neural network from textual accounts in the Imperial Gazzetteer (Nathan et al., 1909). Negative rainfall shocks are the number of standard-deviations below average rainfall in the district-year, or zero if rainfall was above the district average. Drought is a binary indicator for whether the district experienced a drought in the year, defined as rainfall at least one standard deviation below the district's mean. Models (1) and (6) report coefficients in log points, estimated by poisson pseudo-maximum likelihood. Models (2) through (5) and (6) through (10) report coefficients in percentage points, estimated by OLS in levels. District and year fixed effects and Malthusian intercept are included in all specifications but their coefficient estimates are not reported in the table. Coefficients for controls are also not reported; controls include bureaucrat age, experience, number of awards in mathematics and economics, and the share of the district-year's rainfall station-month observations imputed. Observations in columns (1) and (6) are slightly lower because separated observations are dropped prior to estimation by PPML. Standard errors are clustered by district, reported in parentheses.

Table A9: Placebo outcomes

	Log tax demands	Private aid	Private donation	Private charity
	(1)	(2)	(3)	(4)
δ_1: Drought ($\geq$ 1 SD below mean)	0.0369**	0.163	0.0906	0.0171
	(0.0151)	(0.110)	(0.0669)	(0.0609)
δ_2: Malthusian $\times$ drought	-0.0113	-0.134	-0.0226	0.0656
	(0.0145)	(0.190)	(0.117)	(0.135)
Observations	2296	2296	2296	2296
Outcome Mean	1,456,291	0.333	0.133	0.106
Outcome SD	800,865	3.473	1.863	2.021
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	No	No	No	No

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. Table reports coefficient estimates from a regression of log land tax liabilities (column 1, in current rupees) and private intervention probabilities (columns 2 through 4, in percentage points) on drought along with an indicator of whether the collector studied with Malthus at Haileybury, and the interaction of these two variables. Intervention probabilities are imputed by a neural network from textual accounts in the Imperial Gazzetteer (Nathan et al., 1909). Drought is a binary indicator for whether the district experienced a drought in the year, defined as rainfall at least one standard deviation below the district's mean. Column (1) reports coefficients in log points, estimated by OLS in logs. Models (2) through (4) report coefficients in percentage points, estimated by OLS in levels. District and year fixed effects and Malthusian intercept are included in all specifications but their coefficient estimates are not reported in the table. Standard errors are clustered by district, reported in parentheses.

Table A10: Intervention probabilities during drought and famine

Panel A: Relationship with drought				
	Government works	Gratuitous relief	Food imports	Government advances
	(1)	(2)	(3)	(4)
Drought ($\geq$ 1 SD below mean)	2.210***	0.882*	0.802**	2.526***
	(0.688)	(0.510)	(0.376)	(0.736)
Observations	2296	2296	2296	2296
Outcome Mean	1.858	1.142	0.566	1.700
Outcome SD	9.317	9.361	5.627	9.536
Panel B: Relationship with Srivastava famine incidence				
	(5)	(6)	(7)	(8)
Srivastava famine incidence	10.98***	6.464***	4.208***	11.40***
	(1.731)	(1.624)	(1.586)	(1.943)
Observations	1609	1609	1609	1609
Outcome Mean	2.650	1.630	0.808	2.425
Outcome SD	11.036	11.147	6.708	11.314
Specification	OLS	OLS	OLS	OLS
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	No	No	No	No

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Table reports coefficient estimates from OLS regression of the probability of the implementation of each government intervention, imputed by a neural network from textual accounts in the Imperial Gazzetteer, on either: drought in panel A, or famine incidence from Srivastava (1968) in panel B. Drought is a binary indicator for whether the district experienced a drought in the year, defined as rainfall at least one standard deviation below the district's mean. Srivastava famine incidence is an indicator which takes value one only if there is any intersection of the district's boundaries with famine-affected regions in the years pertaining to the famine map. All models include district and year fixed effects; the coefficient estimates for these variables are not reported in the table. Observations are lower than in the full sample for famines from Srivastava (N=2,296) because data is only available from 1858 onwards. Standard errors are clustered by district, reported in parentheses.

B Additional Results

B.1 Famines

To examine whether the differential policies of collectors may have translated into differential famine incidence, I use the panel of famine indicators constructed from records in Nathan et al. (1909) and Srivastava (1968). Table B1 presents estimates of Equation 2 by OLS for this panel.

While Table B1 replicates the result that droughts increase the probability of famine in the district on average, evidence from the Gazzetteer records (columns 1) suggests that droughts are not more likely to translate into famines in the district, or to result in more intense famines (column 2) under Malthusian collectors. Central estimates from Srivastava point to a slightly different conclusion; while droughts are similarly not more likely to cause famines under Malthusians (column 3), the intensity of these events may have been somewhat less severe (column 4), reducing the intensity of famine by one-fourth of a standard deviation.

The estimates using data from Srivastava point in opposite directions, with famines imprecisely more likely but precisely less intense, and the Gazzetteer's more complete panel of famine incidence over the full sample points to a minimal or zero difference across Malthusian and Jonesian droughts. This null conclusion from data in the Gazzetteer is consistent with the magnitude of the differential relief policies through taxes (Table 4) and public expenditures (Table 6). While greater tax relief and public works employment may have reduced agrarian distress during drought and provided substantial income for a targeted population within the district, the magnitude of these policy differences relative to the severity of distress during famines does not seem to have been large enough to affect famines on the extensive or intensive margin.

Table B1: Relative differences in famine incidence and intensity during drought

	Famine, Gazzetteer		Famine, Srivastava	
	Incidence	Intensity	Incidence	Intensity
	(1)	(2)	(3)	(4)
δ_1: Drought ($\geq$ 1 SD below mean)	0.0847***	0.0416***	0.115***	0.0669***
	(0.0199)	(0.0117)	(0.0255)	(0.0129)
δ_2: Malthusian $\times$ drought	-0.0469	-0.0158	0.0327	-0.0584**
	(0.0284)	(0.0201)	(0.0849)	(0.0261)
$\delta_1 + \delta_2$: Avg. Malthusian coef.	0.038*	0.026*	0.148*	0.008
	(0.020)	(0.015)	(0.084)	(0.025)
Observations	2296	2296	1609	1609
Outcome mean	0.08	0.05	0.20	0.09
Outcome SD	0.28	0.17	0.40	0.21
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	No	No	No	No

Notes: * p $<$ 0.1, ** p $<$ 0.05, *** p $<$ 0.01. Table reports coefficient estimates from OLS regression of the binary incidence, or continuous intensity, of famine in the district-year on drought, along with an indicator of whether the collector studied with Malthus at Haileybury, and the interaction of these two variables. All models include district and year fixed effects, as well as Malthusian intercept and controls; coefficient estimates for these variables are not reported in the table. Famine incidence in column (1) is an indicator of whether the year is mentioned in the district's textual accounts in the imperial Gazzetteer (Nathan et al., 1909); famine intensity in column (2) is a probability-weighted average of intensity classifications ranging from 0 to 1, with probabilities classified by a neural network. Srivastava famines are defined analogously; in column (3) famine incidence refers to any intersection of the district boundaries with famine-affected regions in the years pertaining to the famine map, and in column (4) famine intensities are weighted measures ranging from 0 to 1 by the share of the district's area lying under each color-coded intensity region from Srivastava (1968). Standard errors are clustered by district, reported in parentheses.

B.2 Mortality

To examine whether the policies of collectors may have translated into differential mortality, I make use of the available data on mortality rates. Table B2 reports coefficient estimates for Equation 2 via OLS for this panel. I find minimal relationship between drought and mortality under either Jonesian or Malthusian collectors. The data suggest that there were no differential mortality consequences across these groups, which is perhaps surprising given that the differential policies of Malthusians and Jonesians were large enough to potentially impact these outcomes. The direction of the coefficients is also puzzling with, if anything, *lower* mortality during drought under Malthusian collectors.

There are several limitations which prevent a more complete understanding of the true mortality consequences. First, the mortality data are only available for a small subset of the full sample, covering only around one-third of the full panel. Second, these data are based on early vital statistics registrations, which were often incomplete and subject to substantial measurement error, the registration of which improved over time and may have been correlated with the transition from Malthusian to Jonesian administration. Finally, previous scholarship such as Sen (1982) have noted a perverse trend in the worst-affected districts during famines (as late as the 1942 Bengal Famine) whereby mortality rates were lower in the worst-affected districts, suggesting that the local bureaucracy may have been overwhelmed with other responsibilities, to the neglect of maintaining registration of vital statistics. This trend may have also been present in the earlier period which I study, and could explain why I find neither an effect of drought on mortality, nor any differential effect across Malthusian and Jonesian collectors during droughts.

Table B2: Relative differences in log mortality

	(1)	(2)
δ_1: Drought ($\geq$ 1 SD below mean)	-0.0628	-0.0628
	(0.0413)	(0.0410)
δ_2: Malthusian $\times$ drought	-0.0599	-0.0610
	(0.0511)	(0.0507)
Observations	834	834
Outcome mean	22,239	22,239
Outcome SD	15,313	15,313
District FE	Yes	Yes
Year FE	Yes	Yes
Controls	No	Yes

Notes: * p < 0.1, ** p < 0.05, *** p < 0.01. Table reports coefficient estimates from OLS regression of the log number of deaths reported from official statistics for the district-year on drought, along with an indicator of whether the collector studied with Malthus at Haileybury, and the interaction of these two variables. All models include district and year fixed effects, as well as Malthusian intercept and controls; coefficient estimates for these variables are not reported in the table. Coefficients for controls are also omitted; controls include bureaucrat age, experience, number of awards in mathematics and economics, and the share of the district-year's rainfall station-month observations imputed. Standard errors are clustered by district, reported in parentheses.

B.3 Text analysis

Finally, I turn to examining vocabulary associated with each type of economic training that bureaucrats were exposed to at Haileybury. I obtain the subsequent reports written by collectors for one province, Madras, which were published alongside the annual land revenue reports. These reports discuss local proceedings relevant to the duties of the collector in the district-year. This approach is inspired by Ash et al. (2025), who found that judges who received economics training were more likely to invoke economic language in their judgments. I use a similar approach to examine whether bureaucrat vocabulary may hint at the influence of Malthusian or Jonesian ideas on the collectors, and whether they may have invoked this vocabulary relatively more or less during drought years.

This approach can measure similarity between an author and any arbitrary unit of text. I proceed by measuring similarity both by reports and also each of its component sentences, the largest and smallest natural units of text. The cosine similarity measure that I obtain from TF-IDF vectors has a minimum of zero and maximum of one; I multiply by 100 so that these values mimic similarity measured in percentage-points between bilateral pairs of collector text and economist authors, and begin by comparing average differences across Malthusian and Jonesian collectors with OLS.

Table B3 presents estimates of Equation 2 for the cosine-similarity measures; panel A shows that reports written by Malthusians demonstrate a statistically insignificant increase with the vocabulary of Malthus (model 1), Jones (model 2), and Ricardo (model 3) during droughts. The evidence from panel B suggests that the average Malthusian-authored sentence during drought years invokes more economic language overall. The average sentence written by Malthusians during droughts are more similar to the writings of Malthus (9.3% SD increase, model 5), Jones (10.6% SD increase, model 6), and Ricardo (7.7% SD increase, model 7) than the average sentence authored by a Jonesian collector during drought. However, Malthusian-authored sentences do not seem to invoke vocabulary more similar to Malthus than Jones (model 8), compared with Jonesian-authored sentences during drought.

This evidence is similar in some ways to findings in Ash et al. (2025), who show that economic language increased in the judgments issued by judges after receiving economics training. My results suggest that Malthusians may have also invoked more economic language in the average sentence during droughts, compared with Jonesians. However, these differences do not emerge clearly at the report level, and Malthusian reports in drought years do not seem to invoke relatively more Malthusian language than Jonesian language. The most obvious explanation for these differences is that my data, with hundreds of observations at the report-level, is much smaller than Ash et al. (2025), whose data includes the text from hundreds of thousands of judicial rulings. It may also be the case that author-specific influences are much more subtle than the type of economics training

studied by Ash et al. (2025), or that collectors were careful to disguise any Malthusian influence on their judgment, or else that detailed explanations simply would not have been appropriate in the context of these reports in the same way that they would have been for the federal judges studied by Ash et al. (2025). Unfortunately, I am unable to investigate this hypothesis further, as these reports are unavailable for most of the panel.

Table B3: Relative text similarity of collector reports and economist writings during drought, TF-IDF unigrams

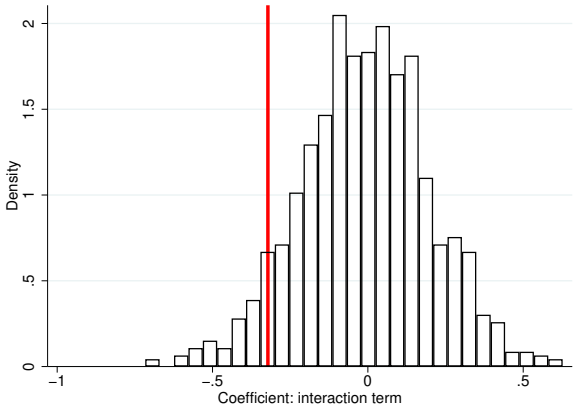
	TF-IDF similarity to:			Difference:
	M × 100	J × 100	R × 100	(M-J) × 100
	(1)	(2)	(3)	(4)
Panel A: Report-level metrics				
Drought (≥1 SD below mean)	-0.0864	0.304	0.341	-0.390
	(0.554)	(0.356)	(0.466)	(0.408)
Malthusian × drought	0.758	0.708	0.0705	0.0505
	(0.841)	(0.862)	(0.748)	(0.786)
Observations	291	291	291	291
Outcome mean	29.84	22.24	18.26	7.60
Outcome SD	3.66	2.93	2.81	2.41
	(5)	(6)	(7)	(8)
Panel B: Sentence-level metrics				
Drought (≥1 SD below mean)	-0.000285	0.0835	0.0997	-0.0838
	(0.168)	(0.0949)	(0.0792)	(0.0944)
Malthusian × drought	0.444***	0.354**	0.268***	0.0895
	(0.155)	(0.158)	(0.0752)	(0.126)
Observations	52972	52972	52972	52972
Outcome mean	5.63	4.13	3.38	1.50
Outcome SD	4.75	3.32	3.50	3.12
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Controls	No	No	No	No

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Table reports coefficient estimates from a regression of a measure of text similarity of collector reports with each author on drought along with an indicator of whether the collector studied with Malthus at Haileybury, and the interaction of these two variables. Drought is a binary indicator for whether the district experienced a drought in the year the collector wrote the report, defined as the district experiencing rainfall at least one standard deviation below its mean. TF-IDF similarity of the language between collector reports and economist writings is calculated for all unigrams (individual words, excluding phrases) from the writings of Malthus (1826, 1836), Jones (1831, 1859), and Ricardo (1817). This method assigns to each word a score based on its frequency in the author's text corpus, relative to its frequency across the corpus of author texts. The similarity of collector reports or sentences are measured as the cosine similarity between the vectors of these word-level scores for the report and author's text. These similarity measures range from 0 to 1, with higher scores indicating higher similarity. The table reports coefficients for the interaction of drought and Malthusian training, at report-level in Panel A and sentence-level in Panel B. Standard errors are clustered by author, reported in parentheses. All models include district and year fixed effects and Malthusian intercept; the coefficient estimates for these variables are not reported in the table. Observations at report-level in panel A are less than in the full sample (N=2,296) because reports are only available for a selection of years in Madras. Standard errors are clustered by district, reported in parentheses.

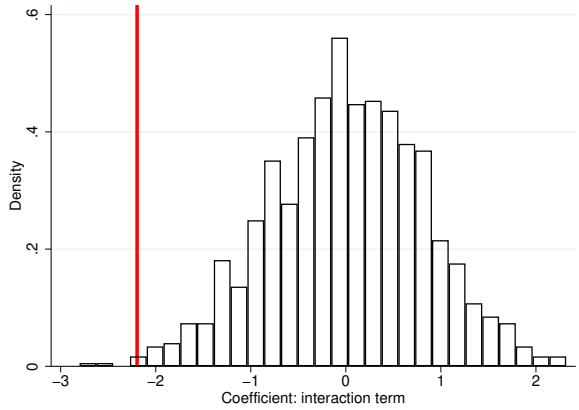
B.4 Randomization inference

I also perform non-parametric hypothesis tests in a randomization inference exercise. Identification rests on the plausibly random assignment of droughts, so that other determinants of policy responses are uncorrelated with drought within each training regime. Randomization inference assigns simulated droughts randomly across the panel, recovers the interaction coefficient estimate, and then compares the distribution of interaction coefficients in the simulated data to the estimated interaction coefficient from the full sample. If the observed responses to drought were due simply to correlation of various collector or district characteristics, then we would expect that a high percentage of the simulated coefficients in randomization inference would be as large or larger than the estimated interaction coefficient from the full sample. This method relaxes the parametric assumptions required by a frequentist approach (t-tests). The share of interaction coefficient estimates smaller than the true full-sample estimate is the p-value for rejection of the one-sided null hypothesis test that Malthusians did not have harsher responses to drought than Jonesians. I also report the two-sided p-value for rejection of the null hypothesis that Malthusians and Jonesians had identical responses to droughts.

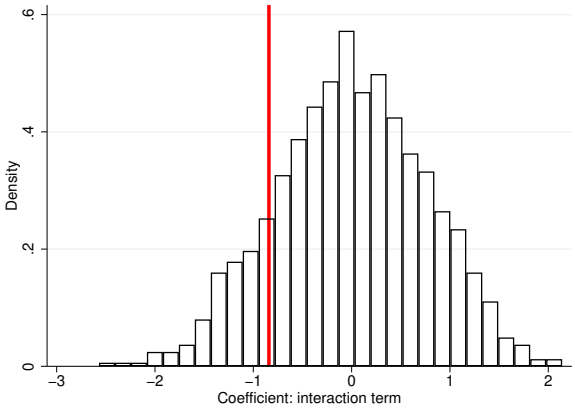
I randomly assign simulated droughts across the panel with the same probability as I observe in the full sample (15%), and then estimate the interaction coefficient from Equation 1 via PPML for tax outcomes, and Equation 2 by OLS for collector commendations and intervention probabilities. I plot the distribution of interaction coefficients from 1,000 simulations against the interaction coefficient estimated from the full sample in Figure B1. The distribution of simulated coefficients are generally centered around zero, with the estimated interaction coefficient from true drought incidence consistently lower than the simulated coefficients across all outcomes. The p-values for rejection of the one-sided (two-sided) null hypothesis are 0.073 (0.130) for tax write-offs, 0.005 (0.008) for government works, 0.140 (0.283) for gratuitous relief, 0.091 (0.160) for food imports, and 0.023 (0.039) for government advances. For all outcomes except gratuitous relief, the the null hypothesis can be rejected at $\alpha = 0.1$ in one-tailed tests. The tax credits outcome seems to have somewhat weaker results from randomization inference compared to the frequentist hypothesis test, but the p-values for the probability of government works and government advances inferred from textual accounts are much smaller under randomization inference; two-tailed test support rejection of the null at $\alpha = 0.05$ for both government works and government advances. The randomization inference exercise suggests that several of the full-sample results seem extremely unlikely to have been observed by chance, and supports the conclusion that the training regime of the collector does indeed seem to have altered their policy responses to drought.



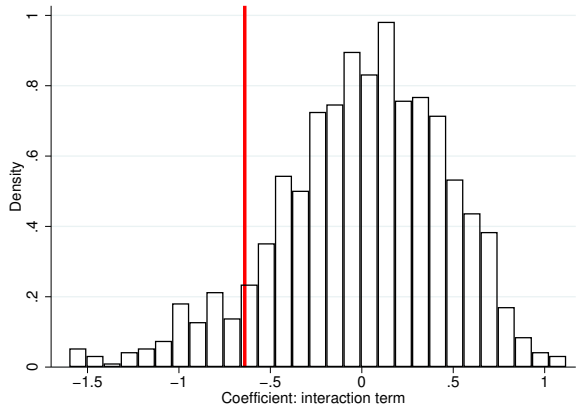
(a) Tax write-offs



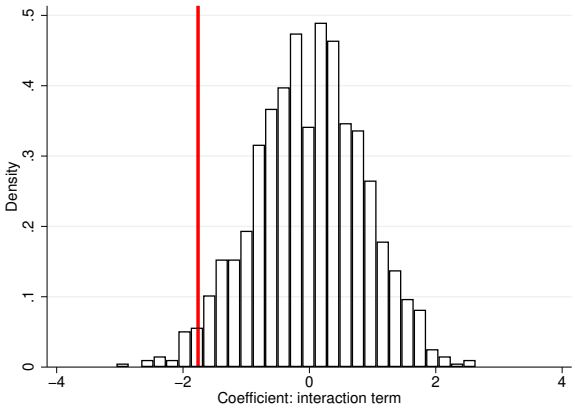
(b) Government works probability



(c) Gratuitous relief probability



(d) Food imports probability



(e) Government advances probability

Figure B1: Randomization inference: tax write-offs and intervention probabilities

Notes: Figure plots the distribution of estimated interaction coefficients from 1,000 randomization inference simulations in which droughts were assigned randomly across the panel with the same probability as observed in the true sample (15%). Coefficients are estimated from a regression of the outcome variable on drought, Malthusian, and their interaction, with district and year fixed effects. Coefficients from panel (a) are estimated by Poisson pseudo-maximum likelihood, and in panels (b) through (e) by OLS. The red vertical line indicates the coefficient estimate from true drought.

Results Appendix References

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C Data Appendix

The table below gives an overview of all sources involved in construction of the data, including its intersection with the time period of the panel to which it pertains in the final panel dataset (i.e. either all years 1846 through 1885, or some subset of these years).

Table C1: Data sources and construction

Data	Source	Time Period	Construction
Collector district assignments	East India registers, civil lists, and Hart's list	1846-1885	OCR and manual digitization
Bureaucrat period of study, awards at Haileybury	Danvers et al. (1894)	1846-1885	OCR and manual string-matching to bureaucrat names
Bureaucrat biographical details: place of birth, age upon entering civil service	Genealogical site: findmypast.com	1846-1885	Extracted from web pages, manual string-matching to bureaucrat names
Tax collections, liabilities, write-offs	Provincial land revenue reports	Bengal: 1846-1885, NWP: 1848-1885, Madras: 1853-1885, Bombay: 1860-1885	Tabular extraction by AI software, manual corrections and matching by district-year
Collector commenda-tions	Provincial land revenue reports	Bengal: 1846-1885, NWP:	Manual string-matching to bureaucrat names
Public works expenditures	Administration reports, Madras	1857-1876	Tabular extraction by AI software, manual corrections and matching by district-year

Data	Source	Time Period	Construction
Prices of food-grains	Department of Finance and Commerce (1887), Provincial land revenue reports	All-India: 1861-1885, NWP: 1848-1853, Madras: 1853-1885	Tabular extraction by AI software, manual corrections and matching by district-year
District boundaries	Office of the Registrar General et al. (2011), Administration reports of Bengal and Punjab	mid-1870's	Georeferencing and manual digitization of district boundaries
Famines	Nathan et al. (1909), Srivastava (1968)	Gazzetteer: 1846-1885, Srivastava: 1858-1885	Manual extraction from text in Gazzetteer or manual digitization of maps in Srivastava
Intervention probabilities	Nathan et al. (1909)	1846-1885	Probability of intervention imputed by AI software from textual accounts
Mortality	Sanitary reports, land revenue reports Madras	Bengal: 1871-1885, NWP: 1867-1875, Madras: 1866-1885, Bombay: 1865-1885	Tabular extraction by AI software, manual corrections and matching by district-year
Economist texts	Malthus (1826, 1836), Jones (1831, 1859), and Ricardo (1817)	N/A	Downloaded full text from OLL, or OCR-based text extraction
Collector reports	Land revenue reports, Madras	1855-1885	OCR-based text extraction, manual string-matching by author

Data	Source	Time Period	Construction
Rainfall	Blanford (1888)	1846-1885	AI-based data extraction, manual corrections and matching by district-year
Land revenue system	Banerjee and Iyer (2005)	1846-1885	Manual string-matching to British district names
Railroad connections, agricultural income	Donaldson (2018)	1850-1885	Manual string-matching to British district names

C.1 Data construction

Temporally, the data focuses on the period 1846-1885; this is the period during which the earliest rainfall and land revenue records became available in the primary sources for each province: from 1846-1885 (Bengal), from 1848-1885 (Northwest Provinces), from 1853-1885 (Madras), and from 1860-1885 (Bombay). Spatially, I focus on the four provinces which were governed by members of the Indian Civil Service: Bengal, the Northwest Provinces, Madras, and Bombay.[66] Some districts were occasionally transferred between provinces; I include districts in the data for all years when they were a member of one of the four provinces. Several districts reported revenues and other official statistics under the province for administrative convenience, but were in reality administered exclusively by military officials; I omit these districts from the panel dataset.

I describe the construction of the data as outlined in Table C1 in further detail below.

C.2 Collector assignments

I construct the history of district collector assignments from official registers, which were published under various titles.[67] These records provide the name and titles of the collector assigned to the district at the time of publication. I use the January editions of these publications, which is

[66] These provinces are generally referred to by British officials as "regulation provinces," and their counterparts (administered primarily by military officials) in the Punjab, Central Provinces, and elsewhere as "non-regulation provinces."

[67] The records from 1854 and 1859 come from the *East India Register*, from 1855-1858 from the *East India Register and Army List*, from 1861-1876 from the *Indian Army and Civil Service List*, and from 1877-1885 primarily from the *India List, Civil and Military*. I use *Hart's List* for the Northwest Provinces from 1877-1885, as many collector assignments listed in the civil list did not mention the district to which they were assigned. I use Hart's list for a small number of additional observations, including assignments in all provinces during the years 1880 and 1884, due to difficulty locating a complete civil list for these years.

approximately the midpoint of the land revenue year, or the first month of the calendar year. In cases where no name is listed for the district, I refer to the May edition of these records as a secondary source. I also record whether a bureaucrat title includes magistrate powers in the district, to measure the extent of their authority within the district. If the identity of a district's collector could not be ascertained from either source, I leave the entry missing and the corresponding district-year observation is excluded from the analysis.

C.3 College cohort

I obtain records on Haileybury graduates from Danvers et al. (1894). I string-matched these names with names from the register to link districts with collectors and the cohort of the collector when they entered the civil service. I manually matched more than ninety percent of the personnel in the appointment records to their respective entry in Danvers et al. (1894). For the small number of bureaucrats for whom I could not find a high-confidence match, or for whom there was more than one possible match, I instead obtain their year of entry into the civil service from the official registers. The registers list their name, district appointment and title, and year of entry into the service. However, these registers do not include information on awards earned at the college; I impute these values by replacing them with their mean value in the panel.

C.4 Economist texts

In order to conduct text analysis, I make use of two texts for each of Malthus and Jones. These include their respective seminal works: Malthus (1826) and Jones (1831), along with *Principles of Political Economy* (Malthus, 1836), a publication which Malthus intended for use as a textbook in political economy, and *Literary Remains of Richard Jones* (Jones, 1859), a posthumously published collection of the writings of Jones, which mainly consists of lectures which he delivered or wrote while employed as professor of political economy at Haileybury.[68]

For simple descriptive statistics as I make use of in the background appendix, I decompose these writings into sentences, and I use a neural network to classify the probability that each sentence pertains to various topics, such as "population" or "population growth" to compare the emphasis of each economist across topics in political economy. I describe the details of this procedure in the subsection on text classification below.

[68] I obtained both texts of Jones by downloading PDF's online and extracted the text from these works via OCR. I obtained the full text for Malthus (1826), Malthus (1836), and Ricardo (1817) from the Online Library of Liberty (https://oll.libertyfund.org/).

C.5 Collector reports

Madras was the only province which included near-annual reports written by the collectors themselves, as other provincial reports were written almost exclusively by provincial authorities rather than district officials. Sometimes collector reports were written several months after the end of the revenue year, and in some cases were indeed written by a different collector. Accordingly, for those years where I was able to obtain these additional textual accounts, I extract the name of the author who signed the report and I identify their year of entry into the civil service by string-matching to the records in Danvers et al. (1894). For the small number of observations where I cannot find a high-confidence match in those records, I obtain the year of entry of the collector into the civil service from the annual registers.

C.6 Collector biographical details

I obtain most collector biographical details from Findmypast, a geneaology service which has photographed and uploaded to their website many of the entry certificates and documents confirming the biographical details and appointments of young men into the civil service by directors of the East India Company. These handwritten records often mention details such as the place and date of birth of the nominee, as well as their relationship with the nominating director, and the year of their nomination.

These biographical details are missing for some of the bureaucrats in the panel. I impute missing values for age at entry by replacing with its mean value in the panel, and for collector age in years by adding the number of years of experience to the imputed age at entry. For collectors without data on their country of birth, I classify as born elsewhere.

C.7 Tax and collector performance records

I obtain data on land tax liabilities, collections, and tax write-offs from the land revenue reports of each province, over the period 1846 to 1885.[69] The panel dimension in these records differs from

[69] In Bengal, Bombay, and Madras tax write-offs are referred to as remissions. For the Northwest Provinces, the equivalent of these write-offs were instead called "nominal balances" because they were nominally held on the account books, and formally written off only after the conclusion of the revenue year. Collectors in Madras held additional powers to write taxes off on land held under the Ryotwari revenue system; for all districts in Madras, I collect these additional measures from the Ryotwar accounts and add them to the year-end remissions to obtain the total tax write-offs within the district-year. Additional balances were held on the tax accounts, but uncollected within the revenue year, and may have later been collected or written off. I do not include these figures as a measure of relief because of difficulty tracking these arrears over time to determine their ultimate status (i.e., collected or written off), and also because of difficulty in attributing these write-offs to an individual collector (i.e., assigning this relief to the collector who originally delayed their collection, or to the collector who eventually wrote them off in the tax accounts in a later year).

the calendar year, usually beginning shortly before the monsoon (June to August) and subsequent harvests, and encompasses the primary period of agricultural tax collection (during the winter and spring).

The annual land revenue reports of Bengal contain lists of officers commended by superior officers for their performance in the respective year. I use these subjective performance reports along with a selection of identical records from the Northwest Provinces, available for only a few years during this period, to construct a measure of bureaucrat performance. For each year, I string-match the names of the collectors listed in these records with the names of the collectors assigned to the districts in the province from the register. For the subset of the tax accounts panel where these commendation records were available, this procedure produces a binary outcome variable indicating whether the collector in a given district-year was commended by their superior for good performance.[70]

C.8 Public works expenditures

I obtain a panel of public works expenditures at district-year level over the period from 1857 through 1876 from the statistical appendices published alongside the annual Administration Reports of Madras. Other provinces occasionally include details on public works expenditures in their annual Administration Reports, but only Madras published district-level records at an annual frequency during this time period. I construct this panel from the annual tabulations of imperial expenditures on public works, the only consistently published series over this period.[71]

C.9 Commodity prices and calories

I collect data on the prices of common food-grains from statistics published by the Department of Finance and Commerce (1887) for a selection of districts across all provinces during the period 1861-1886, supplemented with additional data for any missing district-commodity-years published

[70] There are a few limitations to this measure of performance. Firstly, these records are limited both temporally and spatially, covering only around half of the full panel. For this reason, I am somewhat under-powered in drawing conclusions, especially given the imprecise estimates with respect to performance during droughts. Secondly, these lists were published by superior provincial authorities, and therefore may not reflect precisely the preferences of principals, who were often more senior officials in the central government, the shareholders of the East India Company and, later, the British Crown. Thirdly, these records reflect subjective evaluations, and may be subject to various biases and imperfect information about bureaucrat behavior characteristic of many principal-agent settings, and I do not have an objective performance metric which could validate these subjective measures. Despite these limitations, this is the only data I am aware of which could allow an empirical test of the relationship between the exposure to economic ideas and bureaucrat performance.

[71] Other annual series were published in later years, such as smaller-scale municipal works, but I do not include data from these records due to their limited temporal coverage, which have almost no overlap with the period during which Malthusian collectors were active.

in the land revenue reports of the Northwest Provinces (1848-1853) and Madras (1853-1885). I estimate the caloric content of these commodities from their values in Gopalan et al. (2017), and for back-of-the-envelope calculations I define subsistence as consuming at least 1,500 calories per day.[72] I define as *inferior* the four commodities which trade at the lowest price-per-calorie in the panel.

C.10 Famines

Famines are difficult to measure. Definitions of famine disagree as to whether famine describes only an episode of extreme hunger, or of high mortality, or necessarily of both; moreover, it is not clear as to what extent the word famine refers to an episode during which these conditions apply at an aggregate scale, or whether it may also refer to a period during which excessive hunger or mortality affect only a small part of a region's population. I do not take a position on which definition ought to be applied. Instead, I follow previous economics research by relying on the definition applied by authors examining the historical record, and I verify from official statistics that these definitions predict the type of conditions expected to arise during famine and also corroborate one another.

Previously, researchers such as Burgess and Donaldson (2010) collected famine incidence from Srivastava (1968). I also measure famine from the maps published in Srivastava (1968), but those records are temporally limited to the period of the British Raj, beginning in 1858, up to 1918. My primary measure of of famine comes instead from the Imperial Gazzetteer (Nathan et al., 1909), an encyclopedic directory written by British officials who collated information on a vast range of topics related to the Indian subcontinent. I manually construct a measure of famine from the Gazzetteer by recording all calendar years listed under the famine section of each district's entry in the Gazzetteer. These text entries are an ideal alternative source because they define famines clearly across all district-years during the entire nineteenth century.[73]

To validate my measure from the Imperial Gazzetteer, I compare against the approach of Burgess and Donaldson (2010) by obtaining a panel of famine-affected district-years after digitizing and spatially merging famine maps from Srivastava (1968) to district boundaries. I show in Table C2 that the Gazzetteer famines predict famines in Srivastava (1968) in the post-1858 period of the sample panel (column 3). I also show in Table C2 that the definition of famine applied by authors of the

[72] The estimated caloric content of these commodities may be somewhat overstated by the IFCT data, but I choose a definition of subsistence which is conservative. A large share of each district's population were children under fifteen years old, and these children would have likely been disproportionately represented among the population seeking government relief. Moreover, the average height and weight of adults during this period were probably much lower than their modern equivalents, so that the caloric needs for subsistence may also have been much lower.

[73] Though I do not make use of data before 1846, the textual accounts from the Imperial Gazzetteer report on episodes of famine over a very long period, including some famines prior to the onset of British rule, with the earliest of these taking place in the year 1345.

Imperial Gazzetteer matches the expected statistical conditions of a famine; they are associated with substantially higher prices in sample districts (columns 1 and 2) and predict lower incomes (column 4).

I define district-years as famine-affected if any part of the district overlaps with the region and period pertaining to any map in Srivastava (1968), or for any year mentioned in a district's section on famine in Nathan et al. (1909).

Table C2: Gazzetteer famine: relationship with market prices, Srivastava famine, and real income in sample districts

	(1) Log price, all grains	(2) Log price, inf. grains	(3) Famine, Srivastava	(4) Log real income
Famine (Gazzetteer)	0.198***	0.217***	0.535***	-0.130***
	(0.0162)	(0.0233)	(0.0360)	(0.0292)
Observations	8046	3748	3042	1653
Outcome mean	2.07	1.64	0.17	2.67e+07
Outcome SD	1.19	0.83	0.38	1.86e+07
District FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Commodity FE	Yes	Yes	No	No

Notes: * p $<$ 0.1, ** p $<$ 0.05, *** p $<$ 0.01. Table reports coefficient estimates from OLS regression of log prices of grains in columns (1) and (2), famine incidence from Srivastava (1968) in column (3), or log real income from Donaldson (2018) in column (4) on the binary incidence of famine in the district-year as reported in the Imperial Gazzetteer (Nathan et al., 1909). Data restricts to all sample districts, but does not restrict temporally to the same years as in the full sample. All models include district and year fixed effects, as well as commodity fixed effects in columns (1) and (2); coefficient estimates for these are not reported in the table. Famine incidence from the Imperial Gazzetteer is an indicator of whether the year is mentioned in the district's textual accounts in the imperial Gazzetteer (Nathan et al., 1909). Srivastava famine incidence is an indicator which takes value one only if there is any intersection of the district's boundaries with famine-affected regions in the years pertaining to the famine map in Srivastava (1968). Standard errors are clustered by district, reported in parentheses.

C.11 Famine intensity and government intervention

I also construct a measure of famine intensity based on the color-coding of famine-affected regions in Srivastava (1968). I assign Srivastava's four classifications (no famine, slight famine, severe famine, and intense famine) to a discrete scale ranging in one-third increments from 0 (no famine) to 1 (intense famine). Each district-year observation is assigned an intensity by averaging these values, weighted by the area of the district which falls under each classification. This produces a continuous measure which captures both the extensive and intensive margin of famine. Formally,

I calculate for each district d and year t an intensity measure, I_{dt}, as follows:

$$I_{dt} = \frac{\sum_c I_c \, A_{dt,c}}{A_d}.$$

where $I_c \in \{0, \frac{1}{3}, \frac{2}{3}, 1\}$ is the intensity value from the classification c, $A_{dt,c}$ is the area of district d that falls under classification c in year t, and A_d is the total area of district d.

I mimic this same classification approach for the textual entries from Nathan et al. (1909). I begin by matching each famine episode to the set of sentences pertaining to the famine from the passages for each district in the Imperial Gazzetteer. I task a neural network with classifying the mutually exclusive probabilities that each of the four text labels from Srivastava (1968) best applies to a given sentence set. I then average the same four discrete intensities as above, but in this case I weight these intensities by the probabilities assigned to each label by the neural network, rather than by the share of the district's area.

I also use these passages to impute the probability of various anti-famine government interventions. I begin by taking the set of sentences pertaining to each episode of famine exactly as above. However, instead of predicting mutually exclusive probabilities of famine intensity labels, I task the network to predict mutually inclusive probabilities for each of several types of common government interventions during famine.[74] Further details concerning calculations performed by the neural network are described in the section on text classification below.

C.12 Mortality

I obtain a panel of mortality records primarily from annual Sanitary Reports published in each province. For all provinces, these records begin either in the late 1860's or early 1870's, and report on the total number of deaths registered in each district-year. For Madras, I also augment these records with additional data published in the annual Land Revenue reports, whenever the Sanitary Reports were either unavailable or did not include statistics on total deaths by district.

Unfortunately, mortality records are unavailable for most of study period. Moreover, where they do exist, the administrative tabulations of death rates reflect a process of iterative improvements to the registration system over time, with mortality statistics from early years often highly unreliable. Several of the primary sources from which I constructed the data discuss these issues, and are also considered by Indian Famine Commission (1880, p. 38), who state that "everywhere they are

[74] These labels include common famine countermeasures such as "government investment", "government works", "tax relief", and "government imports" as well as more generic labels such as "government intervention", "government distribution", "government aid", and "government relief".

still incomplete, and in many cases hardly more than rough approximations to the truth." Perhaps most perversely, the maintenance of accurate mortality records seems to have been most neglected during periods of crisis, when administrative demands were highest on other dimensions such as the policing of crime and administration of relief, to the detriment of consistently registering vital statistics. Sen (1982) notes that this feature of the data was an issue as late as the 1942 Bengal famine.

Despite these issues, I could find no alternative records to investigate local mortality consequences and so I conduct empirical analysis with these mortality statistics only with extreme caution, and only as a supplement to the more reliable data on famine incidence and intensity.

C.13 Additional district characteristics

I obtain additional district characteristics from the replication archives of published economic research. I use the landlord classifications from Banerjee and Iyer (2005) and data on railroads and agricultural income from Donaldson (2018). For the limited number of district-year observations prior to 1850, I assign the district's 1850 connection status, the first year of data reported in Donaldson (2018).

C.14 Rainfall

I obtain monthly rainfall for 434 stations from Blanford (1888). Blanford (1888) collected rainfall data from official records held across the many provincial and local offices prior to the 1875 establishment of a unified, all-India meteorological department, and collated these into a consistent record of monthly rainfall by station through the end of calendar year 1886. The earliest data begin in 1813, though many districts do not have a station with rainfall records until the mid-nineteenth century.

I follow Donaldson (2018) by spatially interpolating onto any missing station-month observation, and then averaging rainfall across all station-months within a district to obtain a district-month rainfall panel. I measure district-year rainfall as the sum of the district's rainfall during the 12-month period of either the land revenue year or calendar year, depending upon the time dimension of the panel data under consideration.

For Madras, I also obtain averages from the registers of rainfall collected at the various revenue offices in the district, compiled by the provincial Board of Revenue from returns submitted during the year and published in their annual land revenue reports. I use this data as a supplemental source for those district-months without any observed rainfall data in Blanford (1888) for districts

in Madras. For any district-years with rainfall data meeting cover months during which at least 70% of , the observation is either (1) excluded from analysis due to lack of rainfall data, or (2)

I include panel observations if the available months of rainfall data accounted for at least 70 percent of the district's expected annual rainfall,[75] and I imputed any remaining missing months from the district's long-run monthly means. I omitted any panel observations which did not meet this threshold.

C.15 Text classification

I use a natural language processing model, BART-MNLI, to classify textual data according to a set of predefined categories. BART-MNLI is a member of a class of the transformer family of neural networks, and has been trained to evaluate whether a given statement (the text being classified) entails or contradicts a hypothesis (the classification label).[76] Classification is handled by the underlying BART model (Lewis et al., 2020), additionally trained from the MNLI dataset (Williams et al., 2018) to frame the classification as a natural language inference task, following an approach which allows label assignment without requiring additional, task-specific training data (Yin et al., 2019).

The procedure works as follows: for each piece of text, I presented the model with a short description of each label as a hypothesis. The model then assessed how likely it was that the text entailed or contradicted each hypothesis. For example, if our categories were "population" and "population growth," the model would evaluate the probability that the label pertains to a given input text being classified. I obtain a probability from zero to one, which measures the probability that the label applies to the text, according to the neural network.[77]

This approach has has several advantages over other classification methodologies. First, it allows for systematic and replicable classification of large bodies of text without requiring manual coding. This is more transparent and labor-saving than many approaches, as it does not rely on human judgment. Second, because it is based on a pre-trained model, it can handle nuanced language and context that simpler keyword approaches might miss.

[75] Typically, this required rainfall records at least for the monsoon months, which were more frequently recorded in records from earlier years and accounted for the vast majority of annual rainfall in the districts.

[76] This approach is often called zero-shot classification because the model can assign text to categories without requiring additional training on our specific dataset.

[77] This is the entailment score, divided by the sum of entailment and contradiction scores.

C.16 Text similarity

For measuring text similarity, I use a TF-IDF text metric, where TF refers to the "term frequency" of each word or phrase in a given document, and IDF refers to the "inverse document frequency" of each word or phrase across all documents under consideration (often called the "corpus"). TF captures how frequently each word is used by each economist, while IDF captures how common or rare each word is across the writings of economists, placing higher weight on words unique to one author, and lower weight on words common to multiple authors. I construct this measure for each author, appending two of their texts to construct a Malthus TF-IDF vector and Jones TF-IDF vector, which gives higher scores to terms which are more frequently mentioned by the author, or else which are more unique to the author. For Malthus, I take the full text of his *Essay* Malthus (1826) as well as *Principles of Political Economy* Malthus (1836), the only works of Malthus which appear in an 1843 catalog of the contents of the library at Haileybury. For Jones, I take the full text of his *Essay on the Distribution of Wealth* Jones (1831), which was also included in the catalog, and I add to this the full text of Jones (1859), a posthumously published collection of Jones's writings which includes many of his lectures delivered at Haileybury. To isolate those words which were more characteristics of each author's economic ideas, I remove common English words and also make use of the text of Ricardo (1817) as a third source text. Ricardo discussed similar topics to both Malthus and Jones, and the inclusion of a third author informs the IDF measure by placing lower weight on words which were common across economics, but not distinctive to each author.

The TF-IDF measure assigns to each word a score, the product of its term frequency (calculated for each of the Malthusian, Jonesian, or Ricardian writings) and the inverse document frequency (a unique value for each term, common across all three authors). The same product can then be calculated for any arbitrary document written by Haileybury students which I observe in the Madras land revenue reports. My measure of similarity between a document and each author is the cosine similarity between the TF-IDF vector for that document and the TF-IDF vector for each author. This measure captures how similar the vocabulary of the document is to that of each author, and is designed to measure how closely the document reflects each author's distinctive vocabulary. I describe this procedure below mathematically.

For the corpus consisting of three authors, Malthus (M), Jones (J), and Ricardo (R), each author contributes one combined text formed by appending their individual writings:

$$d_M = d_{M1} + d_{M2}, \quad d_J = d_{J1} + d_{J2}, \quad d_R = d_{R1}.$$

Together these form the corpus

$$\mathcal{D} = \{d_M, d_J, d_R\}.$$

For any term t and document d, define the *term frequency* (TF) as

$$\mathrm{TF}_{t,d} = \frac{f_{t,d}}{\sum_{t'} f_{t',d}},$$

where $f_{t,d}$ is the raw count of term t in the appended document d for a given author. TF therefore captures how frequently each word appears within an author's combined writings.

Let N denote the total number of documents in the corpus ($N = 3$, one per author), and let n_t be the number of author-documents containing term t. The *inverse document frequency* (IDF) is then defined as

$$\mathrm{IDF}_t = 1 + \log\left(\frac{N}{1 + n_t}\right).$$

IDF captures how rare a term is across the writings of the three authors, placing higher weight on words that occur less frequently across author combined text (i.e. is more distinctive or unique to the author). The TF–IDF weight of term t in document d is then given by:

$$w_{t,d} = \mathrm{TF}_{t,d} \times \mathrm{IDF}_t.$$

For each author-document $d \in \{d_M, d_J, d_R\}$, the collection of weights for all terms forms the vector

$$\mathbf{v}_d = (w_{t_1,d}, w_{t_2,d}, \ldots, w_{t_T,d}).$$

Each author $a \in \{M, J, R\}$ therefore has their own TF–IDF representation $\mathbf{v}_a$ based on the entirety of their combined writings.

For a student document s, I compute a corresponding TF–IDF vector $\mathbf{v}_s$ using the same IDF weights derived from all three authors' texts. The similarity between the student document and each author $a \in \{M, J, R\}$ is measured using cosine similarity:

$$\mathrm{Cos}(s, a) = \frac{\mathbf{v}_s \cdot \mathbf{v}_a}{\|\mathbf{v}_s\| \, \|\mathbf{v}_a\|}.$$

where $\|\mathbf{v}\|$ denotes the Euclidean (L2) norm of the vector, $\|\mathbf{v}\| = \sqrt{\sum_t w_t^2}$. This cosine similarity measure ranges from 0 to 1 and captures how closely the vocabulary of the student's text aligns with the distinctive vocabulary of each author. In the analysis, I multiply by one hundred so that this similarity metric is measured from 0 to 100, as if it were measured in percentage points.

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D Additional Background

This appendix outlines additional historical details pertaining to Haileybury College, including the nature of the disagreement between Malthus and Jones, the selection of Jones to replace Malthus, and additional analysis of their writings.

D.1 Haileybury College

Haileybury was located around thirty kilometers north of London, though first opened in 1805 at Hertford Castle in Hertfordshire, and only in 1809 did it move to its permanent buildings at nearby Hailey, from which it took its name. It was designed to meet growing demand for civil servants to govern the territory of the Company on the Indian subcontinent and to appease the East India Company's regulators, who were concerned about potential abuse of patronage by the Company in its selection of civil servants. The school was a compromise to ensure that those appointed by directors were sufficiently competent, with the academic rigor of Haileybury and independent disciplinary powers of its principal (including expulsion) serving to test their competence. Patronage was nearly abolished and the college nearly closed on multiple occasions: in 1817 and again in 1835, before last-minute lobbying by East India Company directors and even faculty managed to preserve it until the 1857 Mutiny.

D.2 Malthus and Jones

At its core, Malthusian population theory holds that because land is finite, the productivity of labor applied to it diminishes as population rises. Unlike later formulations of the law of diminishing returns, which referred only to marginal productivity, Malthus extended the principle to the aggregate: he argued that the total output of an economy must eventually grow more slowly, and could even decline, as population pressed against fixed resources (Cannan, 1892). Through the lens of his theory, Malthus argued that government intervention would therefore fail to limit aggregate economic distress. Of interventions to distribute cash, for example, Malthus wrote that they "cannot... raise a poor man and enable him to live much better than he did before, without proportionably depressing others in the same class" (Malthus, 1798, p. 25). Transfers in-kind were equally impotent; under England's Poor Law, for exmaple, "the quantity of provisions consumed in workhouses ... diminishes the shares that would otherwise belong to more industrious and more worthy members, and ... forces more to become dependent" while also "depress[ing] the condition of those out of the workhouses" (Malthus, 1798, p. 27).

In the Malthusian view, the decline in average living standards came firstly from the declining

productivity of land as it was taken under cultivation; '[i]n the natural progress of the population of any country," Malthus wrote, "more good land will, caeteris paribus, be taken into cultivation in the earlier stages of it than in the later" (Malthus, 1798, p. 39). Malthus acknowledge the potential for some improvements on the intensive margin, but believed that these would achieve the same result. "When acre has been added to acre," he wrote, "till all the fertile land is occupied, the yearly increase of food will depend upon the amelioration of the land already in possession; and even this moderate stream will be gradually diminishing" (Malthus, 1798, p. 34).

By contrast, Jones envisioned the potential for unbounded productivity growth, both raising productivity on existing plots and making new land cultivable, which "may go on till the skill of man and the fertility of the earth have reached their maximum, that is, indefinitely" (Jones, 1831, p. 141). In the view of Malthus, allowing for the absence of diminishing returns in agriculture, as Jones did, would have led to conclusions which seemed impossible. Jones' departure from this assumption must then have "gone beyond the truth," Malthus wrote, because if "cultivation and population has no tendency to diminish corn wages, I do not see what cause should ever retard the rate at which population is known to increase in the new colonies" (De Marchi and Sturges, 1973, p. 389).

In many ways, the opinions of Jones concerning the political consequences of these ideas anticipated the arguments of more modern researchers, such as Ambirajan (1976). Most notably, Sen's entitlements approach was motivated at least in part by his belief that the ideas of Malthus were "widely used by policy-makers, not least in the British Empire," (Sen, 1982, p. 160), and his concern that "the mesmerizing simplicity of focusing on the ratio of food to population has persistently played an obscuring role over centuries, and continues to plague policy discussions today much as it has deranged anti-famine policies in the past" (Sen, 1982, p. 8). Jones seems to have presaged these modern perspectives, writing of Malthusian population theory that "[t]he imperfect... and erroneous manner in which those principles have hitherto been stated have obscured the views and confused the opinions of practical statesmen on some of the most important points of our public policy" Jones (1859, p. 149).

D.3 Instruction at Haileybury

Little material from the lectures of Malthus remain, except in the writings, reminiscences, and the notes of several of his students. His teachings seem to have been comprised of a series of lectures on Adam Smith's *Wealth of Nations* in addition to lectures on his *Principle of Population*.[78] Notes from lectures delivered by Malthus at Haileybury, recorded by a student named Jonathan Duncan

[78] James (2013, p. 245) describes Malthus as lecturing on Adam Smith's *Wealth of Nations* "week after week at the College."

Inverarity, at Haileybury from 1828 to 1830, seem to be the only direct evidence of his instruction.[79]

In addition to the evidence presented in the background section, another student's biography contains additional clues of the influence of Malthus at Haileybury. One author, tasked with chronicling the life of a former student of Malthus, Brian Houghton Hodgson, gave his impression of the influence of Malthus on Hodgson. From their interviews together, Hodgson seems to have described Malthus as a popular figure among the students, "both the favourite and the hero" of Haileybury (Hunter, 1896, p. 16), and also a figure who had a lasting influence on Hodgson, writing that "Malthus was, in fact, the dominant influence in Hodgson's intellectual horoscope" (Hunter, 1896, p. 23).

Jones is described similarly as one of "the most popular" among the professors at Haileybury by Monier Monier-Williams (Danvers et al., 1894, p. 70), who studied at Haileybury during 1840 and 1841,[80] and who recollects Jones' disagreement with "certain views of Adam Smith, Malthus, and Ricardo" (Danvers et al., 1894, p. 174). Along with the various recollections of his students, a more complete record of instruction delivered by Jones is available from the contents of several of his published lectures. The lectures confirm that Jones spent considerable time and energy emphasizing the consequences of capital improvements and outlining his views on population, in much the same way as he discussed in his work on rent; more than half of his lectures were devoted to these topics.[81]

D.4 Succession of Malthus by Jones

Malthus died abruptly of heart disease in December 1834, prompting Haileybury to immediately find an instructor who could replace him. His death came at a time when Jones happened to meet the ideal qualifications for the position, having recently published his contribution to political economy (Jones, 1831) and been appointed as professor of political economy at King's College in 1832. The position he filled at King's College was vacated only by sheer chance; an internal political disagreement between Nassau Senior and several influential figures associated with King's College led to Senior's resignation.[82] Moreover, while there was some dispute over whether the King's

[79] These notes were previously quoted and discussed in the background section, as well as the recollections of John Venn, who attended Haileybury from 1818 to 1820, which offer some of the best evidence of the instruction delivered by Malthus at Haileybury.

[80] Monier Monier-Williams seems to have had a particularly extensive insight into the reputation of Jones, as he was later hired as a professor at the school and taught courses on South Asian languages at Haileybury from 1844 to 1858.

[81] Jones' lectures were published posthumously in 1859, with many of his collections of writings undated; the bulk of this work is comprised of more than three hundred pages of his lectures, with two hundred pages coming from a textbook of lectures on political economy delivered at Haileybury. Of this shorter textbook of lectures, at least forty pages were devoted exclusively to discussion of capital, and seventy to population. The remainder pertained mainly to discussion of labor, determination of wages, and the distribution of wealth.

[82] Senior's crime was publishing a letter (Senior, 1832) which proposed to to divert funds from the protestant Anglican Church of Ireland to the Irish Catholic Church (Bowley, 2013; Political Economy Club of London, 1921).

College position would simply remain unfilled, the eventual appointment of Jones as professor of political economy in 1832 (Political Economy Club of London, 1921, p. 262) meant that Jones was one of the few respected professors of political economy available to replace Malthus when he died in 1834. Had Malthus died even a few years earlier, Jones would almost certainly have lacked the qualifications for consideration.

D.5 Economic language and emphasis

I consider the relative emphasis on various topics by Malthus and Jones, as shown in Table D1. I constructed topic probabilities by tasking a neural network with classifying the probability that each sentence written by either Malthus or Jones pertains to a given topic, and then I regress each of these sentence-level topic probabilities onto a binary indicator of whether the sentence was written by Malthus, along with a constant. This procedure captures a simple difference in means, in terms of the probability of the author's average sentence mentioning a given topic. The coefficient estimates reported in Table D1 for this indicator capture the relative probability (in percentage points) of discussion of a topic in the average sentence authored by Malthus, compared with the average sentence written by Jones.

The table shows in Panel A that Malthus' writings are dominated by discussion of population and population growth (models 1 and 2), with the average sentence close to ten percentage points more likely to discuss these topics than one authored by Jones. In line with this, Malthus discusses the various consequences which he believed were due to excessive population growth, such as poverty and famine (models 3 and 4), up to than one and a half times as much as Jones. In panel B, I show that Jones is more likely to emphasize labor (model 5), as opposed to population, along with the various methods by which he believed the productivity of labor could increase. Agricultural improvements and investment (models 6 and 7) are more likely to be discussed by Jones, consistent with the observation that the average sentence authored by Jones is much more likely to discuss wage growth (model 8) than the average sentence authored by Malthus. The probability of mentioning agricultural improvements, investment and wage growth in the average sentence written by Jones is roughly one-fifth to one-third larger than for sentences written by Malthus.

Table D1: Relative emphasis by topic, main works of Malthus and Jones

Panel A: Discussion of population and poverty				
	Population	Population growth	Poverty	Famine
	(1)	(2)	(3)	(4)
Written by Malthus	9.035***	9.802***	3.713***	2.947***
	(8.40e-13)	(1.16e-12)	(2.86e-13)	(2.45e-13)
Observations	15051	15051	15051	15051
Jones mean	31.52	15.87	13.95	6.13
Jones SD	34.02	28.72	22.15	13.01
Panel B: Discussion of productivity growth				
	Labor	Agricultural improvements	Investment	Wage growth
	(5)	(6)	(7)	(8)
Written by Malthus	-4.313***	-5.301***	-2.461***	-2.596***
	(3.99e-13)	(6.33e-13)	(3.84e-13)	(1.55e-13)
Observations	15051	15051	15051	15051
Jones mean	32.94	26.80	18.93	10.20
Jones SD	34.49	29.93	21.99	17.36

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Table reports coefficient estimates from a regression of the probability that each sentence discusses various topics, as classified by a neural network, on an indicator of whether the sentence was written by Malthus. Each observation is a sentence from one of two works each of Malthus (1826, 1836) and Jones (1831, 1859). Standard errors are clustered by author, reported in parentheses.

Background Appendix References

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